UNIVERSITY OF LONDON THESIS

Degree PhD Year 2005 Name of Author HEBRON, C.S.

Aspects of health, injury and disease amongst the non-elite workforces of Dynastic Egypt

Caroline Susan Hebron

Institute of Archaeology
University College London

Ph.D.

ProQuest LLC
789 East Eisenhower Parkway
P.O. Box 1346
Ann Arbor, MI 48106-1346

Abstract

The non-elite workforces in ancient Egypt were at risk from incurring injuries and acquiring diseases due to the nature of their occupational activities. Manual labour forces were conscripted and relocated to comply with the requirements of corvée duties. Craft specialisation ensured that the performance of particular tasks provided a focal point in the life experience of the non-elite individual, determining their role within society and defining the practical demands of the activity, in terms of expertise and productivity. The intensive manual tasks associated with the processes of quarrying and construction and the repetitive activities inherent in industrial and domestic occupations would have determined the health status of the non-elite individual, potentially manifesting as characteristic and occupation-related physical anomalies. It is unlikely that the social and cultural environment of ancient Egypt would facilitate the recognition of these issues and address the debilitating effects consequential to occupational tasks.

The sources of evidence are surveyed and analysed utilising the textual, artistic, archaeological and human remains sources. Published textual and artistic sources and their interpretations are reassessed. Theoretical models for the working and living conditions at settlement sites based upon published reports and emerging archaeological data have been created. The sources from a number of non-elite cemetery sites are incorporated to explore the possibility of accessing evidence for non-elite health from the human remains. The anticipated prevalence of injuries and diseases appears to be under-represented in the ancient sources, prompting an evaluation of the ancient ideological and cultural perspectives, evidential survival and consequent interpretative limitations imposed upon the data. The sources are reviewed within the social and cultural environment that determined the elite attitude towards the non-elite workforces and consequently dictated their fate, in addition to their inclusion or omission from the ancient record.

List of Contents

Table of Figures

Appendix 1: Tables

Appendix 2: Figures

Acknowledgements

My thanks to the following:

For funding my research:
The Arts and Humanities Research Board

For supervising my research:
Professor John Tait
Professor Tony Waldron
Dr. David Jeffreys

For facilitating research in the field:
Professor Mark Lehner

For library facilities:
Institute of Archaeology
Wellcome Trust History of Medicine
Egypt Exploration Society

For personal communications:
Dr. Richard Redding
Dr. Mary-Anne Murray
Dr. Sarry el-Din
Dr. Zahi Hawass

Introduction

The non-elite workforce in ancient Egypt was essential for the success and perpetuation of Dynastic society. The realisation of state ideology, in terms of raw material procurement and the fulfilment of construction projects, depended upon the availability of substantial manual labour forces. The archaeological record, in preserving the monumental architecture comprising pyramids, temples and tombs, has promoted a focus for Egyptological research that has, until recently, overlooked the associated logistical and social implications for the non-elite that resulted from their participation. The archaeological evidence for society's material accomplishments, the state-planned settlement sites associated with construction projects and the textual sources provide an indication of the possible quantity of human resources required, but contribute only cursory and often indirect allusion to the potential personal cost.

It was my medical training and nursing experience that inspired my interest in exploring the possible health implications associated with the physical labour provided by the non-elite workforces. It was to research this subject first hand that I became involved with the excavation of the 'pyramid builders'' settlement at Giza. This experience has been invaluable in facilitating the construction of a holistic theoretical model of the public health issues dictated by the living conditions emerging from the archaeological data. The examination of the published data pertaining to the health of non-elite workforces in ancient Egypt has highlighted not only the dearth of studies in this area, but also the practical problems associated with accessing evidence for non-elite individuals and their health issues from the archaeological and historical records.

This thesis endeavours to present the relevant sources of data in a systematic manner and to explore the reasons for the under-representation of the health issues pertaining to this sector of society. The evidence requires emplacement within its cultural and social context before an appreciation of its significance can be attempted. Comparison between the data sets is vital for the elucidation of distortions in the evidence, and in creating an understanding of interpretative constraints. The importance of re-evaluating the original sources, where possible, in addition to

studying their relevant publications has been recognised, in order to introduce an up-to-date perspective in the light of emerging information. The sources of evidence have been surveyed, examined and evaluated in turn, assessing their contribution and limitations within the context of the ancient social and cultural environment that influenced all aspects of the ancient record.

Introductory chapter 1 sets out a number of parameters and explores a range of concepts crucial to the subsequent evaluation of the evidence for non-elite health issues. Chapters 2-12 (Section one) present the appropriate evidence in the form of a survey and analysis. Chapters 13-16 (Section two) discuss the role of the various evidential biases and their ability to distort and conceal the evidence for non-elite health issues. Chapter 17 (Section three) explores the conclusions that can be drawn from the evidence in the light of the social and cultural issues that influence the manner in which the fate of the worker was perceived and consequently recorded within society.

Chapter 1

The health of non-elite workforces: interpretative environment and historical perspective

The study of non-elite workforces in ancient Egypt requires an analytical approach to the wide-ranging yet frequently fragmentary sources of data. This chapter sets out a number of parameters that have been instrumental in shaping the interpretation of this complex subject.

1.1. Theoretical framework

There are numerous sources of evidence from ancient Egypt that provide both direct and indirect information about the non-elite workforces. Many of these sources have been published, and these existing accounts, translations and epigraphic reproductions are utilised and analysed throughout this thesis to produce a holistic picture of the evidence we have regarding the potential health issues that faced this sector of society. In addition to the published sources, my involvement in the excavation of the pyramid workers' settlement site at Giza has enabled me to include various unpublished accounts and personal observations of the emerging information. As a consequence of the richness of the data from this site and the insight it provides into the settlement arrangements made for workers on state projects, it has provided the key focus for the proposed theoretical models constructed to highlight health issues amongst non-elite workforces. Additional archaeological evidence selected for discussion in this thesis relates specifically to comparable occupation-related sites such as Lahun, and settlements where designated areas or entire sites were constructed for specific workforces, such as at Amarna or Deir el-Medina.

A significant part of the interpretation of the archaeological evidence focuses on producing a theoretical framework to reconstruct non-elite health issues, including disease patterns and the effects of urbanisation. In the process of constructing this theoretical model I have had to include comparative data from beyond my designated time frame (Scheidel 2001) and outside Egypt itself (for example: Waldron 1989). This is due to a dearth of appropriate studies; (with the exception of, for example, Kemp (1989) and Meskell (2002), an appreciation of the sociological aspects of

communal living in ancient Egypt as derived from archaeological information is lacking), theoretical models have yet to flourish in Egyptology. These comparative studies, exploring the social aspects of urbanisation and ancient disease patterns, have been included for their insight and methodology, as opposed to their historical timeframe, attributes that are as equally applicable to ancient Egypt as to any other culture.

My intention has been to re-examine a carefully selected body of the existing data, include some new sources of information appertaining to Giza, and to produce a critical analysis of what the evidence contributes to our knowledge of health issues amongst non-elite workforces. Any preoccupation with the biases that these sources of evidence are subject to is in response to the frequently unquestioning stance adopted by many of the published reports and accounts considered for discussion within this thesis.

1.2. Defining the non-elite workforces

Cultural expectations of social strata conforming to our understanding of a class system and occupational standing, based, for example, on status at birth, and inherited or acquired material wealth, complicate attempts at defining rank in any ancient culture. Any division invented as a distinction between the elite and non-elite will be arbitrary and subject to disagreement. What is absolutely clear from any standpoint is that the non-elite as a group in ancient Egypt, comprised the majority of individuals within society. Whereas a number of studies have focused upon the identification of a stratified society through the archaeological record (for example Wason 1994; Earle 1997; Arnold 2000), classifying precisely who occupied the various social strata remains problematic. The allocation of a ranking system to an ancient society can only be subjective, as the way in which that society perceived itself cannot be ascertained.

The archaeological record provides various indicators as to the distribution of power and authority throughout a society. Perhaps of primary significance is the relationship between power and status, specifically within the context of interpersonal dependence and differential authority (Wason 1994: 50). The evidence for monumental construction activities demonstrates the materialisation of that power where the

minority controls the labour activities and production output of the majority (Arnold 2000: 15). The balance of power relates directly to the delineation of status between the elite and non-elite. Those subject to corvée duties and the associated infringement of personal freedom that the system entailed in ancient Egypt, can safely be classed as numbering amongst the non-elite. At a more personal level, a distinction can be made between those who had servants and those who served (Meskell 2002: 4). In terms of power and status, I would suggest that the category of the 'elite' in ancient Egypt embraced royalty, officials and administrators instrumental in exacting labour duties from society, whilst remaining exempt from corvée restrictions themselves. The non-elite comprised the remaining sectors of society that would have included a substantial diversity of occupational roles.

Literacy levels, funerary provision, and religious practices can all provide convincing indications of social demarcation, in terms of individuals with access to (and those who were denied) the privileges that inclusion granted. Literacy formed a functional boundary between the elite and non-elite where the illiterate could access the documentary record only through the agency of a scribe. The scribal education as a minority privilege perpetuated the interrelationship between status and literacy. The ability to read and write would have been determined by the nature of the occupation, where administrative positions would require a high level of competence. Studies have concluded that literacy levels approximated one per cent (Baines 1983; Baines and Eyre 1983), with possibly higher rates at Deir el-Medina, an assumption based on the range of textual material recovered from the site (Baines and Eyre 1983: 86). The likelihood remains that the vast majority of the population of any settlement community was illiterate.

Ancient access to the documentary record is significant in two important ways: social advancement was obstructed without the benefit of a scribal training, and any textual reference to the non-elite was indirect, either written by the elite, or with the aid of a scribe. Restricted information has resulted in our imposing an occupational definition for the non-elite individual where little insight into their social role as distinct from their task is attainable. The workers at Deir el-Medina provide a notable exception where, although clearly defined as tomb-builders and associated family members, the complexity of the textual record provides an insight into non work-related issues

highlighting aspects of their 'private lives' as individuals (Meskell 2002). The survival of this evidence does not affect the status of the community at Deir el-Medina, it simply informs us more about it. The impact that illiteracy has had upon our capacity to access information about the non-elite cannot be underestimated.

Ideology provides a potent source of power (Earle 1997: 151), where materialised belief systems created cultural demarcations. Formal religious practice, in addition to funerary provision, was characterised by exclusivity, where restricted access denoted broader implications including the distribution of power and the demarcation of social divisions (Baines 1990b: 22). Funerary architecture, autobiographies, tomb scenes and funerary objects, despite the constraints of conventions, comprise an explicit indication of relative social status. The physical preparation necessary for access to an Afterlife was a sign of privilege. Although it would be too simplistic to make an absolute correlation between wealth during life and degree of funerary grandeur (Wason 1994: 67-90), the general principle is sound. The funerary record provides a range of indications of social rank, including the evidence for expenditure in terms of resources and manpower, spatial relationships between burials, tomb inscriptions and decoration and size and content of artefactual assemblages (Wason 1994: 87-102). Non-elite funerary provision was characterised by simple graves demonstrating minimal expenditure. The inclusion of token tomb goods indicated the expectation of some form of Afterlife (Bard 1994: 6; Meskell 1999: 161), but a more demonstrative expression of anticipated inclusion was generally denied. The distinction between the elite and non-elite funerary arrangements has determined the relative survival of the evidence and prejudiced our ability to recognise the non-elite individual through the cemetery record.

The archaeological evidence for economic wealth, in addition to funerary status, provides valuable indications as to the possible demarcation between elite and non-elite groups. Domestic architecture and artefactual distributions denote relative status (Wason 1994: 111), and an expansion in the variety of range, type and source of artefacts correlates to an increase in the complexity of the social system (Wason 1994: 115). Differential access to raw materials and resources is perhaps the defining feature of social stratification, directly affecting the capability of the individual and community to provide protection from the negative aspects of the physical

environment (Wason 1994: 57; 124). Settlement archaeology demonstrates the variation between individual house units in terms of size and complexity, quantitative and qualitative aspects related directly to status (Trigger 1968: 55-60; Shaw 1992: 153). Non-elite settlement patterns in ancient Egypt have been identified as simple, restrictive, house designs, exemplified by worker's settlements, where basic functionality predominates. More spacious and innovative arrangements, in terms of raw materials and decoration, pertain to the elite domain. Nutritional standards relate directly to status, where availability of food supplies, economic resources and access to raw materials all determine relative wealth. Faunal and archaeo-botanical deposits at settlement sites provide indications of differential dietary arrangements, and the human remains evidence, if available, can determine nutritional limitations indicative of social variation.

The presence of craft specialisation within a society requires both a workforce and an elite sector providing the impetus for production in their role as consumers. The specialists and elite are mutually dependant with the exchange of provisions and sustenance in return for finished goods, but '...specialists themselves are not elite (though they may gain respect through their skill);' (Wason 1994: 107). The social divide between the elite and the artisan is self-perpetuating as the acquirement of the goods produced furthers the differentiation between the strata (Wason 1994: 108).

As apparent from the title of this thesis, my concern is not simply with the non-elite, but more specifically with the non-elite workforces. This might appear to be an arbitrary distinction, where frequently the individual is inseparable from their occupational role, owing to the restricted nature of the evidence for non-elite issues. However, this thesis is most concerned with the health issues pertaining to occupational groups as a result of their occupations, and not solely due to their general social status in society, although that, of course, has a bearing on their choice of, or limitation in, occupation. Today we would term this the study of 'occupational health'. The workforces I have focused on are those that, owing to the nature of their work, were most likely to suffer adverse consequences. These groups include the corvéed labour forces, where their conscription resulted in their relocation in addition to their allocation to labour intensive activities. Both situations would impact upon their health. Those involved in craft or industrial specialisation are also of specific

interest, as the repetitive nature of their tasks, their habitual postures and environment would pose a variety of hazards, both directly and indirectly. The evidence selected for this study is specific in its focus upon non-elite workforces. This is particularly important in an archaeological context, both in terms of settlements and human remains, as the selection process naturally excludes a variety of sources that might pertain to the non-elite, but provide no information about the impact of their occupation. The thesis does not attempt to include all examples of non-elite settlement areas for this reason. Instead, research concentrates on the sites of Giza, Lahun, Amarna, and Deir el-Medina in addition to quarry and mining settlement sites. With these sites we know to a certain extent the occupations associated with each location, and the subsequent models created concerning public health issues are meaningful in terms of the conditions of the workforces involved. Likewise, no attempt is made to evaluate all the, albeit limited, human remains information we possess on the non-elite, but instead the concentration is on cemetery sites associated with occupation-related settlements, or where the occupation of the individual is known from supporting textual or artefactual evidence.

1.2.1. *The occupants of Deir el-Medina: elite or non-elite?*

The residents of New Kingdom Deir el-Medina have traditionally been classified as exceptional in terms of their roles, the locality and location of their settlement and their relative wealth (Meskell 1994: 193). Rank at Deir el-Medina has been assessed utilising various criteria including wealth (Janssen 1975), profession (Bierbrier 1982; L. Lesko 1994b) and funerary provision (Meskell 1999). Despite their specific occupational function, the community may also indicate a complex sociological existence, where the compact settlement pattern would present a range of challenges notable in any urban environment (Eyre 1999: 39). A change in perspective, from exceptional to more representational, has arisen from the recognition that the evidence for life at Deir el-Medina has been skewed by the textual sources, promoting the concerns of the more privileged members of the community (Meskell 1994: 194). Details of the quantity of workers employed, in terms of surviving lists, are fragmentary but suggest variability in numbers according to demand: temporarily redundant individuals would be occupied with transportation activities (Cerný 1973: 103-104). Relative status is difficult to ascertain from the texts (Janssen 1975), as they do not reflect either the integrated settlement or the diversity in the cemetery

(Meskell 1999: 143). The archaeological evidence suggests a complex social structure, with administrators, artisans and general workers living within the confines of a settlement (Janssen 1975: 536), and demonstrating their social diversity in their funerary arrangements. Certainly the funerary provision achieved by members of the Deir el-Medina community were consistent with 'more elite' activities when their decorated tombs are compared to the simple burials identified in the Eastern cemetery. The tomb owners' occupation as 'master craftsmen' enabled them to take advantage of their privileged positions, expertise and access to raw materials, facilitating the construction and decoration of their own tombs. The results of these occupation-related privileges distinguished these individuals from other members of the community, but confuse issues of relative status within the broader social context. There remains sufficient evidence for the life of the non-elite worker at Deir el-Medina to warrant the inclusion of this valuable site as evidence for a working community in all its diversity.

'More-elite' or 'non-elite', the individuals at Deir el-Medina remained skilled and semi-skilled craftsmen, working at the behest of the state, both employed and provisioned by the system. The occupants were certainly not in charge of their own destiny. Aspects of the material culture identified from Deir el-Medina are not so different from the cultic objects or items of personal adornment, usually associated with a more privileged social setting, emerging from excavations at Kom Rabiʿa (Giddy 1999b: 10), and yet the provenance for those items identifies a non-elite setting. I suspect that the accident of survival that favoured the preservation of the settlement at Deir el-Medina in all its detail has led to an assumption, without comparable evidence, that the occupants inhabited a higher social level than their role as tomb-builders warranted. I concur with Meskell (2002: 13) that a distinction can be made between skilled and unskilled workers but that nevertheless 'artisan' or non-elite status applies to the foreman, supervisors, craftsman and labourers at Deir el-Medina. In spite of their skilled occupations, the inhabitants of Deir-el Medina, in common with the rest of the non-elite in society, lacked the power to influence their own lives, an ability relating directly to status and the definition of the elite position.

To summarise briefly; the non-elite workforces, for the purposes of this thesis comprise the illiterate majority who were subject to corvée duties, involved in craft

specialisation, inhabited worker's settlements and were subsequently buried in 'poor' interments. The definition includes those for whom habitual labour would have held physical implications in terms of health and wellbeing. More occasional or non-manual duties, such as administrative or scribal occupations, have been excluded both for reasons of elevated status and their lack of physical demand. The occupants of Deir el-Medina have been included as examples of craft specialists, where the evidence for the practice of 'domestic religion' provides an insight into a potentially widespread activity. The social cohesion demonstrated from the archaeological evidence of the settlement at Deir el-Medina makes distinctions between the various ranks problematic where public health issues would have affected one and all. The more privileged members of the community have been incorporated solely for the information that their decorated tomb scenes provide about occupational activities and anatomical characteristics of the workers within a funerary context. These have been used to supplement the evidence from the exclusive source of elite and royal tombs (Chapter 6; 7). The general categorisation of the non-elite as a group should not overlook the potential for substantial diversity in occupational activity and perceived relative status. Individuals would take advantage of opportunities to access knowledge, expertise and raw materials, imitating the elite where possible in modifying and improving both domestic and funerary arrangements.

1.3. The health of non-elite workforces: historical perspective

Documentary evidence suggests that occupations and their health implications have been viewed differently by societies throughout history. Discrepancies arise as a result of differing degrees of medical advancement, levels of industrialisation and type of industry involved, and the broader issues associated with the organisation of the community as a whole. The workforce must be valued, as a commodity within society, if its welfare is to be of consideration. Impacts upon health require recognition and appreciation prior to any proactive attempts at alleviating the negative aspects of an occupation. Where craft specialisation and manual activities predominate amongst the non-elite in a society, the most significant environmental factor affecting the quality of health and prevalence of disease is the occupation of the individual (Hunter 1978: 14). Dynastic Egypt is notable for its involvement in both manual activities and craft specialisation and this thesis explores the possible implications of this occupational environment in terms of non-elite health. How the

non-elite individual was perceived by society is pivotal not only to the appreciation of the severity of these implications, but also to our understanding of the nature of the evidence available for interpretation. Historical examples illustrate the interaction between medical knowledge, economic objectives and social demarcation according to occupational activity and rank.

According to classical sources, Egypt during the 1st century BC considered the mining workforce to be expendable. Diodorus Siculus described the unenviable fate of the gold miners in 50BC. They comprised a combination of foreign prisoners and convicts amongst the labour force, while foreign mercenaries and native overseers controlled aspects of security and authority. The augmentation of the workforce relied upon conscription including all family members. The miners worked day and night, and were fettered to prevent attempts at escape (Rosen 1943: 14). The following extract aptly demonstrates their plight:

'For though they are sick, maimed, or lame, no rest, no intermission in the least, is allowed them: neither the weakness of old age, nor women's infirmities, are any plea to excuse them; but all are driven to their work with blows and cudgelling, till at length, overborn with the intollerable weight of their misery, they drop down dead in the midst of their insufferable labours; so that these miserable creatures always expect worse to come than that which they then at present endure, and therefore long for death as far more desirable than life.' (Booth 1814: 159, translation of Diodorus Siculus III).

Diodorus Siculus has been criticised as an unreliable source, indiscriminately incorporating earlier works. In doing so, he has preserved potentially valuable information, although in many instances the facts are unsubstantiated. Murphy (1985) and Sacks (1990) discuss the problems associated with Diodorus Siculus as a source. If this description of the mining environment is an accurate one, it is unlikely that occupational health issues would be addressed, even if they were identified. This does not mean that hazards were not distinguished, but rather that the workforce was not considered sufficiently valuable to be protected. More likely, the intention to punish the criminal element amongst the workforce exacerbated the suffering, and the high mortality rate amongst the participants represented a fitting punishment.

Early writers on health failed to recognise occupation as a causative factor in the various conditions and diseases of interest. Hippocrates ('Airs, Waters and Places', 5th century BC) identified the importance of the environment (specifically seasons and temperature) in its positive influence on the individual, but neglected any relationship with the environment of specific occupational settings (Walton *et al* 1994: 685). Interestingly, Hippocrates noted that the contemporary Egyptians were consistent in stature and temperament due to the constant climate (Adams 1881: 61). It is not surprising that whilst 'medicine' was proposing these macro-environmental factors both as indicators of growth patterns and as causative factors of disease, the more immediate occupational influences were being neglected. Alternative examples of cause and effect were provided by Hippocrates in his recognition of the negative aspects associated with, for example, horse-riding where varicose veins, lameness and hip-joint stiffness featured as direct consequences (Chadwick and Mann 1950: 107). More specific references to the health hazards associated with occupational tasks were absent.

Task-related health issues have plagued individuals for as long as repetitive and hazardous actions have been performed in deleterious environments. Only cultural and social perspectives and medical understanding have masked their prevalence. Documentary evidence suggests that the connection between occupation and health ('occupational health' as we classify it), is a relatively modern concept. The dangers and diseases experienced by miners in 16th century Europe brought the negative aspects of this particular occupation into focus (See Hartmann 1887; Hunter 1978: 27-29 for details on Agricola 1494-1555; Paracelsus 1493-1541). The cultural environment persisted in distorting the relationship between tasks and health, preferring a spiritual explanation (Hartmann 1887: 133). Agricola writing *De Re Metallica* in 1550 attributed occupational hazards to the workers' carelessness (Hoover and Hoover 1950: 6) indicating that the concept of occupational health was still remote (Rosen 1943: 58).

Bernardino Ramazzini (1633-1714), a Professor of medicine at the University of Modena, constitutes the first recognised source to document the connection between occupation and health and, as a result, has been denoted the 'Father of Occupational Medicine' (Walton *et al* 1994: 685-6). He wrote *De Morbis Artificum Diatriba* in

1700 recording his observations on a wide variety of manual occupations, and their associated implications for the welfare of the individual. He recognised the problems of incorrect posture, poor ventilation and dust inhalation and recommended the use of protective clothing in dangerous situations (Wright 1940: 19). His most remarkable achievement was, however, his ability to set aside cultural perceptions and to recognise the relationship between occupation, social class and disease (Hunter 1978: 37). Despite this accomplishment, it is apparent that the observations made by Ramazzini were concerned primarily with economic as opposed to humanitarian issues. He recognised the importance of raw material procurement both as a necessity for industry and as a source of individual wealth. Whilst acknowledging the presence of the hazards, he questioned the utility of treating diseases of 'men of that class', thereby extending their life expectancy (Wright 1940: 19). In a society where the working classes occupied a position of such low status, the occupational risks they experienced were viewed as inconvenient in relation to the level of production.

The Industrial Revolution, in the early 1800s, introduced a new scope and scale for occupation-related disease. The development of occupational health, as a study in the prevention of the ill effects of occupations, has increased in direct relation to advances in mechanisation (Hunter 1978: 149). This change in philosophy was partly economic and partly philanthropic. The excessive levels of occupation-related disease and trauma in Victorian England impacted both on the level of production and the conscience, culminating in the passing of the 1898 Factory Act which lists known occupational diseases and designates them as 'notifiable' conditions (Hunter 1978: 182).

Developing countries, undergoing a rapid rate of industrialisation, are unable to safeguard their workforce due to the lack of resources and expertise. The high level of occupational diseases and disorders are similar in prevalence to those observed during the industrial revolution in Europe (Walton *et al* 1994: 686). Fatalities on labour intensive industrial projects were high, as demonstrated by an example from 19th century Egypt. A corvée workforce, including 40,000 men from Qena, excavated the Mahmoudieh canal in the Delta; 20,000 died in the process (Stuart 1882: 161). Over the three years of construction 400,000 men were involved and up to an estimated 100,000 died (Richards 1982: 23). These figures are, however,

unsubstantiated, but the incidence of self-mutilation to avoid corvée duty (Richards 1982: 24) indicates the extreme reluctance, on the part of the individual, to be conscripted.

In contemporary society, occupational health in Northern Europe and America includes the provision of a safety-conscious work environment, where risks to the workforce are minimised. Where accidents do occur, treatment is provided promptly by skilled practitioners, with specialised knowledge and resources, in an appropriate environment. We have devised a system of complaints, whereby legislation can result in compensation made available to those injured or debilitated in the workplace. These measures exist for medical conditions that we, as a society, link with occupation. Our knowledge is not exhaustive and new problems arise constantly.

The recognition of the relationship between workplace practice and the health of the workforces, is directly related to the degree of craft specialisation, industrialisation and the utilisation of substantial labour forces, where a sufficient quantity of cases have to be observed to become noticeable as a phenomenon. The increasing level of industrialisation in the late 17th and early 18th centuries in Europe may have prompted Ramazzini to make this connection. Similarly, the working environment in ancient Egypt, characterised by specialist tasks and mass labour forces may also have facilitated the recognition of occupational health issues.

1.4. The concept of disease in an ancient context

The perceived boundary between health and illness is rooted within social and cultural expectations (Rogers 1960). Herodotus (2: 77) remarked upon the comparatively healthy status of 5th Century Egyptians (De Sélincourt 1996: 113). Our temptation is to suggest possible explanations for the apparent misrepresentation of the circumstances (Lloyd 1976: 332), as the statement contradicts our knowledge of the human remains evidence. Health is a highly subjective issue and, whilst we persist in considering Herodotus misled, or in feeling a deep concern for the compared populations, it is similarly inaccurate to overlay our culturally and socially imbued perceptions of health upon an ancient population. Definitions and concepts of illness and health, and consequently the recognition of an acceptable or normal state of health vary culturally (King 1962: 67). For example, a study of the *fellaheen* in the

Nile Delta, noted that '...chronic illness seemed to be considered a part of life.' (Khalil 1977: 22) and intervention was sought only if the individual became too unwell to perform their usual tasks. The evidence from the human remains in ancient Egypt suggests the prevalence of chronic ill health and widespread infestation with parasites (David and Archbold 2000: 173) that would result in fatigue and an increased susceptibility to infectious diseases. If symptoms were generalised throughout the community then they were likely to be accepted as the 'normal' state of health (Khalil 1977: 23).

Establishing an appreciation of the social concept of disease in ancient Egypt is inherently problematic, where evidential and cultural biases disguise the ancient attitudes and the record of misfortune. Disease may have been viewed as one aspect of the many unfortunate incidents experienced within society, including crop failures and flood irregularities, as opposed to occupying a distinct category (Fábrega 1997: 6). The absentee list from Deir el-Medina incorporates illness amongst other miscellaneous justifications for absence (Janssen 1980; Chapter 2: 2.4.). Greater detail is provided by the texts relating to medical and surgical issues and by the evidence for physicians attached to particular projects (for example: Gardiner *et al* 1952-55: 94; 121). The medical texts provide an insight into the perceived causes of diseases, recommended remedial procedures (Chapter 5), and indicate the concept of the 'abnormal' within society, but little indication of the broader social impact of disease is contributed. The textual references to malignant influences and demons as causative agents of disease (Table: 3. Appendix: 1) concurs with the concept of disease as an alien intrusion or enemy at war with 'nature' (Grmek 1998: 247). The elite perspective inherent within the textual record is likely to influence the content in favour of social priorities, in terms of 'high profile' diseases, possibly in advance of more prevalent but less-elite conditions, or reflect the personal interest of the author of the text.

The acknowledgement of disease is initialised by the recognition of an inability to fulfil social function, in terms of designated role or occupation, due to the experience of pain or general incapacity (Grmek 1998: 241). The importance of the social role in ancient Egypt, and its relationship with the maintenance of *Maat* would suggest that disease or injury resulting in an inability to perform, in addition to detracting from the

perceived physical ideal, must have held wider implications for the individual than the disability alone. The acquirement of disease may have involved a moral explanation (Grmek 1998: 244), although the concept of fate and the role of malevolent forces perhaps detracted from personal culpability. Appreciating the wider social implications of disease is complicated by the uncertainty of ancient cultural and genetic factors with the potential to influence their prevalence and patterning. More recent data suggests that the range, affect and behaviour of diseases over time is subject to change (Scheidel 2001: 113-114). At present, the potential for hereditary predisposition or resistance to disease in a community remote in time cannot be assessed, although future scientific analysis and more importantly the availability of a representative sample of human remains data may provide some indications. Meanwhile, the sources pertaining to health and disease are complicated by both the classification of the status itself, and by the elite and cultural inequities that determined the content of the historical record.

1.5. The evidence and its interpretation

Compiling and understanding information about the non-elite workforces and their health issues is dependent upon the nature of the data and the evidential biases, which in turn require our ability to balance both aspects and interpret the outcome. The sources of evidence that provide the basis for discussion have been selected, reviewed and analysed in section one of the thesis. Section two identifies the various evidential biases and explores their influence over the conclusions (Section three) that can be drawn about the health of non-elite workforces in ancient Egypt.

Sources have been selected covering an expansive time scale constituting the dynastic period (approximately 1600 years). This era was characterised as one of innovation in monumental building and craft specialisation and provides an informative background against which to examine the fate of the worker. Unfortunately the accident of survival has determined that although, for example, workers' settlements survive from Old, Middle and New Kingdoms, the human remains data from all periods is scarce. Any reduction in the time scale covered by the thesis would result in significant information vital to our understanding of non-elite health amongst workforces being omitted, a situation that was felt to be too reductive. Consequently, the amount of information produced by incorporating evidence from this time scale is daunting, so

specific attention has been applied to the criteria for the inclusion or exclusion of data. Chapters 2-12 review the range of examples included for discussion. No attempt has been made to include every possible piece of evidence, but data has been selected for its relevance to the subject. Discussions have been dictated according to the complexity of the information provided. These parameters are necessary if the thesis is not to become unmanageable, and even stricter regulations have had to be applied to the utilisation of additional data from beyond the set time frame. Examples have only been cited where they contribute significantly to the subject and their omission would be detrimental to our understanding of the issues involved. These exceptions are not tabulated amongst the data sets, but arise as comparative details in subsequent discussions. The incorporation of specific examples from disparate time periods inevitably produces a skewed sample. As the data is fragmented by the accident of survival, additional arbitrary selection only contributes to its unrepresentative nature. Any consequent interpretation has been mindful of these limitations in the data and it has not been assumed that the various sources produce anything close to a cohesive picture.

There are inherent problems associated with accessing information about the non-elite in ancient Egyptian society, highly significant are those caused by the elite perspective that pervaded most aspects of the evidence for non-elite existence, and was successful in disguising and distorting information pertaining to this social majority. The accident of survival has contributed to the evidential imbalance, where an apparently comprehensive selection of data, on closer scrutiny, clearly pertains almost entirely to an elite minority. Indubitably, the monumental, artefactual and philological preoccupation demonstrated by traditional Egyptologists has contributed to an inadequate appreciation of non-elite issues. Although the academic climate is shifting slightly to incorporate a more social and anthropological view, there is much ground to cover. Typically, Egyptology has adopted a data specific approach, promoting a disjointed view of the sources, and resulting in isolationism that has inhibited both the questioning of previous assumptions and the instigation of theoretical approaches to interpretation. Specialisation has contributed to the depth of knowledge in specific areas, but has also resulted in a restricted view of broader implications. Minimal appreciation of the biases at play in distorting the information, either within an ancient context or due to modern perceptions, has resulted in the

creation and acceptance of finite conclusions potentially founded upon misinterpretation (a situation discussed by Van Walsem 2001: 175-179).

Evidential biases and ancient cultural dynamics have influenced the restriction in direct references to the non-elite in the ancient record. The extraction of information and subsequent interpretation frequently requires a circuitous approach to the evidence, where an appreciation of the non-elite individual relies upon an understanding of the social relationships that structured the community and dictated occupational function. The study of non-elite activities provides tangible indications of the technology and methodology adopted, and those relating specifically to conscripted duties demonstrate the dictates of broader social organisation. Practical task-related issues have been addressed by excellent publications detailing aspects of technology and procedure (for example: Arnold 1991; Lucas 1962; Nicholson and Shaw 2000), and the social and logistical implications of manpower organisation have been explored (for example: Eyre 1987a; 1987b; and to an extent Valbelle 1990). Unequivocally as a result of the scarcity of information, in addition to an elite professional bias, the theme of non-elite contribution, in terms of personal cost and the 'humanitarian' issues associated with an enforced labour regime, has been predominantly ignored.

Conversely, ancient Egyptian medicine and health has provoked a substantial quantity of research due to the preservation of mummified remains and of texts relating to medical remedies. Evidential and professional biases have circumscribed the potential for the study of non-elite human remains, and the medical texts have been subject to detailed philological studies (for example: Grapow 1954-1956; Von Deines *et al* 1958a-1973; Westendorf 1999). The early translations of the medical texts were a product of their time, reflecting the cultural aspects of the philologist almost to the same extent as those of the ancient Egyptians (for example: Bryan 1930; Breasted 1930; Ebbell 1937). Unfortunately, interpretative errors have been perpetuated even within highly reputable publications (for example: Nunn 1996: 57), and only a minority of researchers return to the original data in order to minimise inherited misunderstandings (for example: Weeks 1984; Walker 1996). Both areas of study have focused upon the identification and classification of conditions with little

appreciation afforded to the broader social implications of the diseases and injuries identified.

The advent of craft specialisation and its attendant concentration of activity, in addition to labour-intensive industrial ventures in Dynastic Egypt, would provide an appropriate environment for highlighting aspects of task-related disease and injury. Comparable evidence suggests that it would be appropriate to hypothesise that the workforces, especially those involved in quarrying, mining and construction operations would demonstrate a high prevalence of injuries and diseases. It would be expected that individuals would risk fatality due to occupational activity, and that the workforce would include a proportion of maimed participants as a result of injuries sustained. Supporting evidence for these expectations is not immediately apparent from ancient Egyptian sources, as complex ideological rationale and interpretative issues distort the presentation and accessibility of information. Section two of this thesis explores aspects of this under-representation in the data, highlighting the evidential limitations that inhibit a comprehensive appreciation of the health of non-elite workforces.

Section One

Aspects of health, injury and disease amongst the non-elite workforces of Dynastic Egypt: survey, analysis and interpretation of the evidence

Introduction

Textual evidence

The utilisation of the written word was restricted to a small percentage of ancient Egyptian society by limited access and illiteracy. Literacy was the domain of the elite, administrators and scribes. References to the workforces were almost exclusively indirect and subject to elite perspectives, although examples do exist where less-elite workers with access to scribes were able to document personal and domestic matters. The ability to write was in itself a status symbol, pertaining to a social elevation aptly demonstrated by scribal exercises that denigrated the plight of workers not favoured by a scribal training. Within this elitist cultural environment, acquiring information about the non-elite workforces and further evaluating its significance is problematic.

Inscriptions, including those within tomb and temple complexes, and papyri comprise a varied source of textual references from ancient Egypt. Their subject matter is diverse, but can be summarised into the following broad categories: monumental inscriptions of political, religious and ideological significance; graffiti; administrative documents; technical, medical, religious and magical texts; tomb and funerary inscriptions and texts; in addition to fictional/factual literature. It is important to appreciate that there is no evidence to suggest that the ancient Egyptians categorised their literature in this way; this classification is subject to our cultural understanding.

The subsequent chapters relating to the textual evidence review a selection of data amongst the sources of ancient Egypt that relate to the non-elite workforces and their health. It is not feasible to include every potential reference due to constraints both on time and space, but I am confident that most aspects have been covered sufficiently. As would be expected, the data is frequently fragmentary and piecing together information from different sources and periods constitutes a challenge. The textual

evidence has been chosen and included where it provides either direct or indirect reference to health issues, administration, organisation or welfare of non-elite workforces. The specified time frame for the thesis comprising Dynastic Egypt to the end of the New Kingdom (3rd-20th Dynasties (2686-1069 BC)) has been adhered to as strictly as possible.

The textual evidence has been subdivided into the following chapters:

Chapter 2: Expedition texts
Inscriptions and administrative documents relating to aspects of procurement and employment, corvée duties and recruitment logistics

Chapter 3: Domestic religion
Sources relating to aspects of domestic religion that highlight social and individual practices in an attempt to avert disease, injury or misfortune

Chapter 4: 'Literature'
A selection of texts that might be classed as 'literature', comprising teachings and tales that provide an insight into environmental or personal issues of the period, specifically those concerning social dynamics and the role of fate within the community, working conditions and attitudes towards death

Chapter 5: Medical texts
Texts that indicate the range of diseases and injuries confronting society, highlighting surgical and medical conditions and attempts to avert illness and treat the sick.

Artistic representational evidence
Tomb scenes from an elite funerary context provide an opportunity to examine the ancient Egyptian representation of the human form. Despite the iconographic restrictions imposed upon the form and content of funerary scenes, the depictions of aspects of 'daily life' provide a comprehensive insight into procedural and environmental factors inherent in specific occupations. The health implications for the non-elite individuals involved can be inferred. In addition, specific scenes include examples of non-elite individuals displaying a range of physical abnormalities.

These anomalies, some of which may portray actual abnormalities (as opposed to artistic conventions or errors), may in turn denote congenital defects and/or symptoms of a range of diseases. The identification of the specific conditions depicted would facilitate an appreciation of both occupation-related and environmental dependant issues. Accurate identification is, however, subject to the distortion of evidential and cultural interpretation, where the diagnosis of symptoms is sufficiently problematic in contemporary patients and would not be attempted from pictorial evidence alone. Understanding is impeded by the ideological, social and religious significance of visual representation in both an ancient and a funerary context, and the complications associated with the cross-cultural appreciation of artistic media. The potential for misunderstanding constitutes a combination of intentional devices employed by the ancient Egyptians in the selection of representational material, and subsequent human intervention as a significant factor amongst the criteria for the survival of the evidence.

The subsequent chapters detailing artistic representations review a selection of scenes amongst the numerous depictions of non-elite individuals and their occupations. Tomb scenes provide a particularly comprehensive source of information pertaining to non-elite activity and occasionally to health issues themselves. It is not possible, nor particularly meaningful to catalogue or quantify the various illustrations that relate to either occupation or to health, as the sample is both random and incomplete. Instead examples have been selected from each category to provide a basis for discussion.

The artistic representational evidence has been divided into the following chapters:

Chapter 6: Trauma

The scenes that have been denoted as examples of occupational trauma, the evidence for treatment methods and an isolated example of a surgical procedure

Chapter 7: Anatomical abnormalities

A selection of scenes depicting anatomical abnormalities in conjunction with non-elite occupations raises the potential for the identification of an occupational origin for specific diseases.

Chapter 8: Protective equipment

Examples of occupational scenes that include representational evidence of protective equipment as indications of preventative action

Chapter 9: Occupational tasks

Tomb scenes and models that relate directly to occupational tasks, and highlight environmental, procedural or technological hazards

Archaeological evidence

The archaeological evidence provides an insight into the material nature of the living and occupational settings of the non-elite. It is possible, in some instances, to apply our knowledge of environmental and occupational health factors to the archaeological record, creating theoretical models to highlight the potentially detrimental impact of these physical surroundings upon the individual and community. In this way, a greater appreciation of the human cost of the craft specialisation and constructional activities that were central to the political and ideological identity of Dynastic Egypt can be attained. Although the frequent paucity of evidence and interpretative restrictions render the record incomplete and subject to misunderstanding, the data is potentially informative about aspects of non-elite existence largely absent from alternative sources.

There are inherent problems associated with the construction of theoretical models in an historical context, where the very nature of the process overlies ancient data with a modern construct. It is important to keep cultural implications in view if the exercise is to produce meaningful information. The use of culturally loaded phraseology can distort interpretation, and for that reason I include the following definitions of 'public' and 'occupational' health issues, as they relate to our society, and to what extent they can be applied in an ancient context:

Chapter 10 concentrates upon the health implications associated with the change in physical environmental imposed by the duties of conscripted labour, with specific reference to the Old Kingdom pyramid builders at Giza. These changes included the removal from a rural to an urban setting, and the inherent health hazards associated with living in close proximity with other workers from different geographical areas.

The organisation of supplies and the standard of living quarters would have been important considerations in the spread and control of disease. Today we would call these factors public health issues, and would use the following definition:

Public health is '...the science and art of preventing disease, prolonging life and promoting health through organised efforts of society. Its chief responsibilities are the surveillance of the health of the population, the identification of its health needs, the fostering of policies which promote health, and the evaluation of health services' (Walton *et al* 1994: 823).

This definition demonstrates the complexity of approach adopted by our society to these issues. I am not suggesting that the ancient Egyptians approached matters in the same way, or even recognised areas where improvements would result in an increased standard of health for the community. This would require a depth of understanding in the aetiology and transmission of diseases that the textual sources lead us to believe the ancient Egyptians did not possess. I therefore use the term 'public health' indeterminately, in reference to the physical conditions imposed on ancient Egyptian urbanised society, in order to hypothesise about the expected impact upon their health.

Chapter 11 highlights the considerations associated with the performance of the tasks themselves. Specifically, the manual labour required for constructional activities including pyramid building, must have been hazardous in the extreme, with injuries and fatalities occurring on a regular basis. Today, in our society, these consequences would be identified as occupational health issues and measures would be taken to minimise their detrimental impact upon the workforce. All tasks incur a degree of risk to the individual (Table: 5. Appendix: 1), but whether society acknowledges occupation as a contributing factor to the causes of disease relies heavily upon the social dynamics and medical expertise of the community in question. Our modern definition of occupational health is as follows:

'Occupational medicine is that branch of medicine concerned with the effects of work on health, and the effects of health on the ability to work. It is essentially a discipline in preventive medicine. The evolution of the concept of occupational health, initially

from observations on industrial disease, can be traced from antiquity.' (Walton *et al* 1994: 685).

In ancient Egypt, the utilisation of substantial labour forces for construction projects would have enabled an observation of disease and injury patterns. Again, I am not suggesting that the ancient Egyptians operated a complex strategy in occupational health or medicine, as we would approach it today. In fact, the artistic evidence suggests that few precautions were taken to safeguard the workforce, even in obvious ways (Chapter 8). I have applied the term simply to highlight the issues of task-related injuries and disease, which would have occurred regardless of any medical or surgical understanding. It is significant that in ancient Egypt, where state projects involved the relocation of the workforce to urban settlements, both 'public' and 'occupational' health factors would have been important for the welfare of the individual and the community.

The archaeological evidence from settlement sites can provide information about aspects of the environmental experience and the material culture of the non-elite sector of society. Living and working conditions would have held direct health implications for the individual and wider social group and in some cases it is possible to reconstruct the environment from the evidence to examine these potential affects more closely. Naturally it is out of the question to survey all the archaeological evidence within the confines of this thesis. A selection has been made of the most apposite sites based upon their ability to provide information directly relating to the non-elite sector of society. The subsequent chapters focusing upon the archaeological evidence are divided as follows:

Chapter 10: Public health issues

The construction of theoretical models for the evaluation of public health issues utilising the evidence from settlement sites, paying particular attention to occupation-related habitations

Chapter 11: Occupational health issues

The construction of theoretical models for the evaluation of occupational health issues relating to the non-elite workforces utilising the evidence for stone construction, specifically pyramid building as an example

Human remains evidence

It might be anticipated that the direct evidence represented by the human remains of the workforces themselves would provide a less prejudiced indication of the real health issues, injuries and diseases that featured during their lifetimes, when contrasted with the alternative sources discussed above. The presence of physical evidence, in the form of observed anatomical irregularities, provides a tangible basis for discussion, despite the interpretative limitations inherent in establishing conclusive causative factors (Manchester 1983: 21). Contrary to these optimistic expectations, the limited quantity of human remains data available for study is subject to numerous factors, responsible for the introduction of a range of evidential distortions that, as with all aspects of the ancient record, disguise the information regarding the health of the workforces. These factors, active in skewing the archaeological record, include; cultural and ideological influences regarding the location and mode of burial, formation processes affecting preservation, retrieval priorities, the constraints imposed within palaeopathological research, and the accuracy of subsequent interpretation.

A range of diseases, by no means comprehensive, can be identified from the human remains evidence. The accessible data provide a limited insight into a selection of the diseases that would have afflicted ancient Egyptian society. In common with the other sources of evidence, the human remains evidence favours the elite in terms of burial patterns, survival and excavation priority. A positive factor constitutes the fact that within the parameters of environmental and nutritional potentials, disease is and was the great social equaliser and those conditions identified through the study of the elite remains also provides an insight into the plight of the socially less advantaged workforces. Consistency over time in pathological response facilitates comparisons between the pathology of ancient, historical and contemporary populations (Manchester 1983: 11), but comparative hypotheses on the wider social impact must

be cautious where the evidence suggests significant differences in the range, prevalence and effect of diseases throughout history (Scheidel 2001: 113-114).

Chapter 12: The human remains evidence

An analysis of specific samples of non-elite human remains data from a number Dynastic settings focusing on the reconstruction of aspects of nutritional status, occupational injury and disease and the evidence for medical intervention.

Chapter 2

Expedition texts

The ancient Egyptians were active in the procurement of raw materials from within their boundaries and from neighbouring lands. Their ability to negotiate successfully the 'chaos' of the deserts and return with precious metals and stones was significant both economically and ideologically. The concept of 'divine kingship' was perpetuated by these activities, providing confirmation that the pharaoh was fulfilling his duty in controlling his domain and by reinforcing the material wealth of the centralised authority (Shaw 1998: 251). The success of these enterprises relied upon the availability of a manual labour force. The organisation required in defeating logistical improbabilities constituted a significant part of the challenge. Expedition texts indicate the substantial number of participants required. For example, 17,000 individuals were numbered at the Wadi Hammamat quarry during the 20th Dynasty (Couyat and Montet 1912-13; Shaw 1998: 250). Perhaps the 11th Dynasty inscription at the Wadi el-Hudi amethyst mines referring to 1500 recruits indicates a more usual size for an expedition (Sadek 1980: 17; Shaw 1998: 247), but the varying challenges and objectives associated with specific excursions were likely to determine the size of the party. The substantial numbers involved played a part in demonstrating the economic and administrative success of the ruler, and provided the opportunity for recognition, promotion and reward amongst the expedition leaders.

Within this ideological and political environment it would be anticipated that the documentation relating to expeditions would primarily be concerned with broadcasting the success of the enterprises. The combination of propagandist principals and the restrictions exercised over expressions of misfortune would be expected to be effective in disguising any references to non-elite or negative issues. Whereas this is true for the majority of the monumental inscriptions, occasionally they supply information concerning the titles of the workers that, in addition to the administrative documents detailing organisation and rationing, provide an insight into the logistics and the nature of the workforce itself.

In order for expeditions to remote destinations to be successful, in terms of fulfilling their objectives and minimising risks, efficient organisation and co-ordination were of paramount significance. The mutual dependency between different social groups and occupations indicated by, for example, the New Kingdom 'loyalist teachings" (Parkinson 1991: 70-72; Chapter 4), would have been particularly important to these geographically isolated contingents of workers and officials. The texts concerning expeditions emphasise the cohesive nature of the team happily united in their efforts to carry out the will of the gods and the king. The reality was likely to have been very different

The following table summarises the selection of texts included in this chapter. They supply logistical details of the organisation of expeditions, labour requirements and supply arrangements. They form a diverse collection of sources including monumental and administrative inscriptions, papyri and body labels.

Title	**Date**	**Provenance**	**Content**	**Principle sources**
Papyrus Cairo JE 49623	6th Dynasty	Not known	Clothing and equipment supplies for the Tura quarry workers	Wente 1990: 42
Body labels	Old Kingdom	Not known	Personal details of deceased	Goedicke 1968
Inscription	11th Dynasty	Wadi el-Hudi	Titles and origins of participants on expeditions	Sadek 1980
Quarry marks	Middle Kingdom	Lisht, Dashur, Mentuhotep, Abydos Hawarra, Saqqara, Lahun	Control notes recorded on individual stones	Arnold 1990
Dashur decrees (Berlin 17500)	6th Dynasty	Dashur (el-Shenab)	Exemption for specific persons involved at the pyramid town from royal duties including taxes and labour	Goedicke 1967
Stela	12th Dynasty	Serabit el-Khadim	Celebratory record of expedition success	Gardiner *et al* 1952-55
Personnel lists	12th Dynasty	Serâbit el-Khâdim	Titles on expeditions, including stone workers etc.	Gardiner *et al* 1952-55
Stela	19th Dynasty	Wadi Mia	Water supply at gold mine	Davies 1997
Quban stela	19th Dynasty	Wadi Allaqi	Dehydration at gold mine	Davies 1997
Inscription	19th Dynasty	Gebel es-Silsila	Supplies on expeditions	Davies 1997

Title	Date	Provenance	Content	Principle sources
Inscription	19th Dynasty	Manshiyet es-Sadr	Supplies on expeditions	Davies 1997
Papyrus oriental institute 16991	20th Dynasty	Deir el-Medina	Interruption to supplies	Wente 1990: 50-51
Absentee list	20th Dynasty	Deir el-Medina	List of work absentees	Janssen 1980
Inscription	20th Dynasty	Wadi Hammamat	Expedition participant list	Couyat and Montet 1912-13

A number of papyri relate to the recruitment of participants for corvée labour. Principally administrative in their content, they highlight the processes that were instrumental in ensuring an adequate labour force for specific state projects.

Title	Date	Provenance	Content	Principle sources
Papyrus Reisner 1,2,3	12th Dynasty	Nagᶜ ed Deir	1. Administration and division of labour 2. Royal workshops 3. Corvée tasks	Simpson 1963, 1965, 1969
Papyrus Berlin 10023A	12th Dynasty	Not known	Punishment for corvée defaulters	Wente 1990: 74
Papyrus Berlin 10073	12th Dynasty	Lahun	Assembling labour force and documenting absentees	Scharf 1924 Wente 1990: 76
Papyrus Kahun 1.7	12th Dynasty	Lahun	Promise of a prompt delivery of corvée participants	Griffith 1898 Wente 1990: 85
Wilbour papyrus (Brooklyn 35. 1446)	13th Dynasty	Not known: possibly Lahun	List of corvée participants failing in their duty and their subsequent punishments	Hayes 1955

2.1. Ideology of procurement

The expedition, as a unit, was viewed as a foray of the civilised and ordered world into the unknown regions of the desert (Shaw 1998: 256), as an analogy with the role of *Maat* within a chaotic outer existence. The construction of temples at quarrying and mining sites and the continuation of offering routines perpetuated the concept of the recreation of a self-contained Egyptian civilisation within the desert. Gardiner *et al* (1952-55: 39-40) noted that the temple inscriptions at Serabit el-Khadim in the Sinai included a large proportion of officials' names in the offering scenes, and commented that it would appear that the expedition elite were taking advantage of

their remote location to bestow royal privileges upon themselves. Conversely, no temple has been identified from the excavations at Wadi el-Hudi, but, due to the relatively convenient location of the site close to the Nile valley, the expeditions may have been of short duration, not warranting the establishment of a permanent structure (Sadek 1980: 104). The inclusion of a lector priest on expeditions (Sadek 1980: 103) suggests that the religious requirements of the team, maintaining minimal cultic procedures, were still catered for.

It was important that the expedition was seen to be under restraint, successful, whole and duly representative of central control and order. The portrayal of this completeness is aptly demonstrated by a stela commemorating an excursion to Serabit el-Khadim during the 12th Dynasty: 'My expedition arrived, fully complete. No loss to it ever occurred.' (Gardiner *et al* 1952-55: 97; Parkinson 1991: 98). As this concept appears in more than one inscription (Gardiner *et al* 1952-55: 139), it may represent a formulaic rendering of the leader's self-congratulation. Whatever the explanation, it appears that the notion of no human loss was an ideal. The stigma attached to an unsuccessful expedition was elucidated in the literary text 'The Shipwrecked Sailor', where the sole survivor of an excursion was reluctant to face his country and community as a failure (Lichtheim 1973: 213; Chapter 4). This may of course constitute a literary device, simply fulfilling a narrative function (Baines 1990a: 59). The importance of wholeness pervaded many aspects of ancient Egyptian culture, not least the funerary belief that the body required all its anatomical details to ensure a successful Afterlife. This concept of integral parts ensuring function may have masked the true situation regarding fatalities and casualties on expeditions, in an ideological attempt to disguise the fragmentation of the whole. Alternatively, if the workforce were regarded as an undifferentiated mass then partial losses could have been overlooked as unremarkable.

2.2. Personnel

The teams comprised professional, possibly military, leaders and mass corvée labour forces (Eyre 1987a: 10; 18), although the translation and significance of various titles remains obscure. An 11th Dynasty expedition to the amethyst mines at Wadi el-Hudi in Nubia enlisted the local Nubians to provide the manpower (Sadek 1980: 11). This arrangement reflected the general pattern of recruitment that favoured the selection of

the leaders from Lower Egypt and the labourers from the locality of the specific mine or quarry to be exploited (Sadek 1980: 103). Consequently, the danger of assault from the neighbouring communities whilst on expedition may have been reduced. The explanation for the military origins of expedition leaders may derive from the requirement to address this risk of insurgence from the Nubians on expeditions to the south, or from the *Bedouin* tribes in the Sinai. An acknowledgement of this potential hazard was encapsulated by the inclusion of a characteristic 'pharaoh smiting foreigner' scene at the temple at Magharah, the turquoise mine in the Sinai (Gardiner *et al* 1952-55: 27), ideologically reinforcing the superiority of the king over foreign tribes. The textual and artistic evidence is predominantly silent upon the status and identity of miners and quarrymen; possibly due to the assorted nature of the temporary workforce they were not defined as a distinct group (Shaw 1998: 246). 'Stone worker' was a general term applied to a number of labourers (Gardiner *et al* 1952-55: 94), but 'recruits' and 'braves' was used to denote the majority of the unskilled workforce (Sadek 1980: 17), the variability of their tasks possibly rendered further classification meaningless.

The system of corvée required an administrative structure to organise and allocate the workforces, and a number of texts indicate the practical logistics involved. A specific bureaucratic department was designated the 'office of labour' in the Middle Kingdom (Parkinson 1991: 59). Documents from the 'office of labour' indicate a dehumanising system of allocation, perhaps unavoidable with the logistical considerations (for example: Parkinson 1991: 85). Examples of personnel lists provide details of recruits by place of origin (Shaw 1998: 247), although documents recording fugitives from enforced labour demonstrate the knowledge of name, place of origin, gender and mode of escape (Parkinson 1991: 99-101), implying a detailed registration of the individual. A number of letters form the same period refer to the process of identifying, collecting and delivering participants (For example: Papyrus Berlin 10073. Wente 1990: 76. Papyrus Kahun 1.7. Wente 1990: 85). The Dashur decrees (Berlin 17500. Goedicke 1967) indicate that exemption from corvée labour was possible, but only for the privileged. Documentation from the Old Kingdom lists the names of sailors who died abroad and arrangements for their transportation home for burial (Eyre 1987a: 14). This consideration extended to expedition leaders on desert forays to mines and quarries, but there is no evidence to suggest that the general

workforce were similarly treated. Unfortunately, tangible evidence in the form of burials at, for example, quarrying and mining sites has yet to be identified. Cases 510-514 of the Ebers papyrus (Ghalioungui 1987: 139-140) are devoted to the treatment of weals following beating, and it is possible that physical punishment comprised an official penalty in addition to a means for settling private disputes. The price for non-attendance was high in terms of sequestered property and privilege (Eyre 1987a: 18) and the inclusion of shabtis in elite burials, to perform corvée duties in the Afterlife, denotes how intrinsic enforced labour was to life experience in all sectors of society.

A 13th Dynasty papyrus (Wilbour papyrus: Brooklyn 35: 1446) provides details of individuals (75 men, 1 woman) who had failed in their obligation to fulfil corvée duties. The text provides a register of fugitives and instructions for their handling at a prison in Thebes (Hayes 1955: 19-25). The prison housed both criminals and corvée defaulters (Hayes 1955: 37-38). Punishment for desertion consisted of flogging, the indefinite allocation to agricultural state labour, not to be reviewed until after ten years service, or possible internment in the 'great enclosure', which constituted a centralised labour camp (Hayes 1955: 47; 53; Parkinson 1991: 99-101). The terms and conditions of corvée labour must have been particularly relentless if individuals were prepared to risk a life sentence of permanent labour if caught absconding (Hayes 1955: 132). The fugitive's dependants were substituted if the escapee remained elusive, as indicated by a 12th Dynasty papyrus (P. Berlin 10023A), that documents the conscription of a temple doorkeeper as a replacement for his absent son (Wente 1990: 74).

More details of the nature of corvée duties were included in a 12th Dynasty text from Nagᶜ ed Deir (Papyri Reisner I-III. Simpson 1963-1969). A register is provided of hundreds of workers at Koptos, including women (Simpson 1963: 41; 47). The specific nature of the duties is unclear although diversity is indicated by the reference to some form of rubble infilling, raw material transportation and weaving (Simpson 1963: 36; 47). Of particular interest is the record of a large proportion of days spent 'fleeing' (Kadish 1996: 443-444). It is possible that an alternative explanation simply indicating days 'absent' would be more appropriate, referring to the fluctuation in

labour requirements inherent in any project, and documented to account for the entire workforce on a daily basis (Simpson 1963: 36).

There is little textual evidence that provides an indication of the process of actual tasks, and where exceptions occur, the information is an indirect inclusion within an otherwise economic or accounting system. For example papyrus Reisner I, mentioned above, documents the division of labour and 'man days' associated with various tasks (Simpson 1963: 56-58), within a text concerned primarily with raw materials, labour costs and supplies (Saffiro 1977). Additional corvée tasks, including carpentry and agricultural duties are referred to in papyri Reisner II and III (Simpson 1965; 1969), but little indication is given about the process of tasks themselves. More informative, although possibly a device for monitoring productivity, are the Middle Kingdom quarry marks identified at various pyramid and temple sites. They supply evidence for the crews of workers involved in the various stages of the construction, the separation of tasks amongst the teams and the location of the particular processes. A distinct division of labour is manifest, where both occupation and habitation was centred around the specific activity area (Arnold 1990: 19). Teams were designated with geographical names, perhaps indicating the origins of the workers (Arnold 1990: 22), but more likely as a tool for instant recognition in accounting. The dating system implies all year round activity, with possibly a peak in transportation during the inundation, but unfortunately the record is incomplete (Arnold 1990: 32).

2.3. Working conditions and health implications

Conditions on expeditions must have been challenging. The work was hard, the climate extreme and all supplies required transportation from the Nile valley by members of the expedition. Archaeological evidence from quarrying and mining sites indicates that shelters were basic (Engelbach 1938: 372; Sadek 1980: 104) and that little protection was provided from the extremes in temperature. Although direct comparisons cannot be made, living conditions remained rudimentary at mining sites into the roman period where workers were housed in a series of small villages (Maxfield and Peacock 2001: 211). It is likely that the corvée labour force was housed in temporary shelters to avoid the excess in building activity that would be required to accommodate such large numbers. Murnane (1975: 32-33), in his examination of the personnel involved on Sinai expeditions during the reign of

Amenemhat III, has suggested that the high turnover of leaders was a result of the appalling conditions experienced on the expeditions. Other alternative explanations would include the acquirement of sufficient promotional opportunities after one expedition, rendering further forays unnecessary for personal advancement.

It would be expected that casualties and fatalities on desert-based quarrying and mining expeditions would be considerable. Dehydration, disease and injuries would have taken their toll. Stelae from the New Kingdom were concerned with the provision of a water supply for the workers involved in desert-based expeditions. An example from the reign of Seti I at the Wadi Mia gold mine, Kanais, in the eastern desert recounts the successful establishment of a well (Davies 1997: 209). The theatrical language adopted for the inscription combined the apparent royal concern for the thirsty worker with the requirement for the king's name to be perpetuated as an instigator of laudable actions. An inscription from the reign of Ramesses II relating to gold mining at Wadi Allaqi in Nubia (Quban stela) stated that previous expeditions would have lost half of their personnel and donkeys due to dehydration (Eyre 1987b: 182; Davies 1997: 237). As the purpose of this stela was to commemorate the success of Rameses II in constructing a well at the site, these historical references were likely to have been exaggerated. It was a common literary device to denigrate the attempts of predecessors to make personal comparisons appear favourable. Despite the bias of political propaganda, the stelae indicate the fact that dehydration was a serious problem without a local water source. This concept of the king's ability to produce life-giving resources from the barren landscape was likely to have held ideological significance, in providing affirmation of his divine status and capability in 'civilising' the unknown, by rendering areas of the uninhabitable desert capable of supporting Egyptian life.

Physicians have been included on expedition personnel lists (for example: Gardiner *et al* 1952-55: 94; 121) suggesting that the inherent dangers were anticipated. Their position on the list may not reflect any hierarchical ranking, nor indicate that their advice was not highly valued. Unfortunately, comparative evidence as to the relative standing of doctors within the rest of society is lacking. The deification of Imhotep as the great medical innovator (Hurry 2000) and the retrieval of pristine copies of medical texts from funerary contexts indicate that medicine as a discipline was

respected. It is not known whether the physicians on expeditions were subject to the corvée system, but if not, perhaps only the inexperienced or low-ranking physicians could be persuaded to join the team. An alternative to the physician on some expeditions was the scorpion magician (for example: Parkinson 1991: 99) whose role was to treat the frequent stings that would have warranted a specific member of the team to be included for this purpose.

As casualties and fatalities were likely to have been intrinsic to any expedition, it is surprising that they were not referred to in the texts, other than to state that an expedition without incident was an ideal. Of course the record is far from complete, but the paucity of evidence is, nevertheless, striking. In a society where the administration was diligent in accounting for commodities and tools, it would be expected that personnel would have to be accounted for also. Four unprovenanced ostraca from the Old Kingdom have been identified as body labels (Goedicke 1968). They state the identity of the director of the workforce, and the name, place of origin and parents' names of the deceased. The deceased, in these examples, belonged to the low social-rank of oarsmen. The body labels provide important information about the administration of burials and how bodies were identified and presumably recorded between death and burial. It is not known whether these labels were subsequently buried with the individual, or formed part of a registering system which was carried whilst alive and removed at burial, comparable to the procedure in use by our modern day military. It is possible that the labels themselves provided an official register of losses without the requirement for additional textual records. The existence of a system of tagging is indicative of an administrative solution to a common occurrence. Graeco-Roman Egypt utilised mummy labels as identity tags during the transportation of the body from the place of death to their home environment (Mueller 1973: 175; Scheidel 2001: 10-16), possibly indicating the continuation of an ancient practice.

The majority of inscriptions at quarrying and mining sites were dedicated to the success of the expedition. One example that has been denoted as an exception is the detailed account of an expedition to the Wadi Hammamat during the reign of Ramesses IV. It lists a total of 8368 participants in addition to what has been interpreted as 900 dead (Couyat and Montet 1912-13: 38: line 9). If this translation were correct (as suggested by for example: Baines 1991: 135; Peden 1994: 27), then

this text would indeed be exceptional, and provide the potential for hypothesising about fatalities on expeditions. Suggestions have been made that the public nature of the record demonstrates that the human loss was unremarkable (Baines 1991: 135), but in fact the translation is uncertain. Possibly the translation of *w3* as meaning 'to move into a new state' (Erman and Grapow 1971: Volume 1: 245-246) has encouraged the assumption that it implies death. More likely alternatives include the concept of being separated from or leaving a situation (Faulkner 1991: 52). Both options imply that the individuals referred to were called away for other duties. Before designating this account as a demonstration of insensitivity towards fatalities amongst the workforce, it is important to consider alternative translations and to contextualise the information within the broader context. If death were being referred to then the evidence does suggest that the workforce were viewed by the elite as a commodity, an attitude that was reinforced by the influence of *Maat* in perpetuating the social role of the individual and order (Chapter 4: 4.1.).

In return for their co-operation and labour the workforces were provisioned by the state. Adequate supplies would have been vital on expeditions where alternative sources of sustenance would not be available. Inscriptions from the reign of Seti I from the sandstone quarry at Gebel es-Silsila, Upper Egypt, and from the reign of Ramesses II from Manshiyet es-Sadr, Heliopolis state that the workers were provisioned plentifully (Davies 1997: 203; 230-231). Representing sections of monumental inscriptions, the true value of these statements is impossible to substantiate. It is also not clear as to whether the professionals or the less-elite workmen were being referred to (Baines 1991: 136). Provisions also included clothing (Cairo JE 49623. Wente 1990: 42) and equipment. A papyrus from the 20th Dynasty royal tomb workers (Oriental Institute 16991) employed at Deir el-Medina demonstrate the consequences of an interrupted supply route even at their location close to the Nile valley:

"All supplies that derive from us from the treasury, that derive from the granary, and that derive from the storehouse have been allowed to run out.
May my lord provide us with a means of staying alive, since we are already starving. We are no longer living if nothing whatsoever is given to us." (Wente 1990: 51).

The workforces involved on state projects were totally reliant upon the state for their welfare for the duration of their duties. This arrangement cannot have been an entirely reassuring proposition when faced with the arduous tasks involved and the uncertainty of basic provisions in a hostile desert environment.

2.4. The absentee list from Deir el-Medina

A unique example amongst the sample of documentary evidence that survives from ancient Egypt comprises an administrative text excavated from Deir el-Medina. Although not strictly an expedition text, it has been included as it provides direct reference to the organisation of a working community. Dated to the 40th year of the reign of Ramesses II it details the reasons for absence from duty given by the royal workmen (Janssen 1980; Davies 1997: 309-333). A diverse selection of excuses was listed, including illnesses amongst other misfortunes, and positive reasons including celebrations. Unfortunately the text is not descriptive of the nature of the injuries or diseases that detained the workers: most often the entries simply specify 'ill'. An eye injury, a scorpion sting and ambiguous references to hand and foot complaints represent the only distinctive examples (Janssen 1980: 136). It may well be that for the purposes of the record, details of the illness were not required as it was primarily concerned with missed days as opposed to concerns about health. The medical and magical texts indicate the complex classification used to denote injuries and diseases and the terminology that would have been available to the scribe. More illuminating, however, is the evidence that the work relations apparent at Deir el-Medina allowed individuals to take rest days for a variety of reasons, including bereavement in the family and preparations for feasts, indicating a more mutually beneficial system than would perhaps be expected.

To summarise, the texts that refer to expeditions and corvée duties highlight the ideological and practical significance of procurement and construction in Dynastic Egypt. The organisation of expeditions and the utilisation of manual labour forces were central to the success of these activities. The texts indicate the role of the non-elite within society in fulfilling their duties within a bureaucratic framework that impinged upon their personal freedom, and their punishments when failing to fulfil their conscription. The absence of textual evidence for casualties and fatalities amongst the workforce results from the political and administrative agendas fulfilled

by the majority of the sources. The inclusion of physicians on expeditions is the clearest indication that incidents that must have been numerous actually existed.

Chapter 3

Domestic Religion

Religious or cult activity in ancient Egypt encompassed both the official and unofficial world-views. The evidence suggests that a differentiation existed between the exclusive and celebratory perpetuation of divine kingship and *Maat* demonstrated within temples and elite tombs, and the response by the individual and the community to personal misfortune (Baines 1991: 130). The 'unofficial' latter category comprises a corpus of letters, stelae, decrees and spells that were utilised by the non-elite as protection against negative influences and as proactive stances in the face of adversity. Their style and content is informative regarding the nature of ancient Egyptian fears and the pragmatic response they elicited.

The textual evidence relating to misfortune, and in particular, health and disease include the medical texts, sources relating to domestic religion, administrative reports and literary works, all of which were subject to bias at both the recording and survival stages. Misfortune and evil were predominantly excluded from the 'official' record, with the exception of the practical remedial measures detailed by the medical treatises, thus masking potential references to incident and accident. The concept of *Maat* was pervasive and significant in portraying an ordered world that omitted many negative aspects encountered in reality.

There is little evidence for private religious practices prior to the New Kingdom (Spalinger 1998: 248). Of course this situation may relate to the accidents of evidential survival, or alternatively it might reflect activities that originated during periods characterised by the decentralisation of power, as far back as the First Intermediate Period, but only reaching fruition subsequent to the Amarna Period (Assmann 1989: 69). Our retrieval of evidence from the late New Kingdom may further correspond with a rise in an individualistic responsibility for religious concerns, corresponding to a decline in 'secular' demonstrations of ideology (Baines 1984: 48), resultant from the substantial inconsistencies demonstrated by state religion. The documentary evidence for this 'domestic religion' is confined to a meagre sample originating from a limited number of sites. It is not possible to estimate how representative the evidence is, in terms of typicality or duration, and

naturally there are inherent dangers in extrapolating the data, or in basing assumptions upon single examples.

The settlement site at Deir el-Medina provides the locus for a disproportionate amount of the evidence pertaining to domestic religion in the form of '*3ḫ iḳr n Rˁ* stelae and sources relating to requests for divine intervention. Evidence from the Amarna workmen's village suggests that the distribution of domestic shrines was not limited to the non-elite habitations, providing an indication of a socially inclusive practice (Stevens 2003: 165). The position of Deir el-Medina as a suitable source for the basis for broader speculation has been addressed in Chapter 1 (1.2.1.). Failing the excavation and interpretation of a more representative sample of settlement sites, it is not possible to establish whether the occupants of Deir el-Medina were typical of other communities, or if their documents were characteristic of other collections. The unusual status of the workmen at Deir el-Medina facilitated their access to materials and knowledge, including perhaps exceptional utilisation of scribal expertise, customarily restricted to the elite (Demarée 1983: 280-281). This potentially unique position is further illustrated in the workers' ability to construct and decorate their own tombs, and it has also been suggested that their professional capabilities may have increased their literacy status (Baines and Eyre 1983: 89-90; Janssen 1992). However unrepresentative, the evidence from Deir el-Medina indicates the response of a particular working community of craft specialists to the misfortunes and illnesses that concerned them, and in this capacity represents a valuable source and reason for inclusion. Perhaps it is misguided to expect that any community would reflect the activities of society as a whole, and provided generalisations are avoided, analysis and interpretation remains a valid exercise.

The sources denoted 'domestic religion', indicate the importance of a continuing interaction with the deceased as a significant factor in the concept of the Afterlife. A mutual dependency was perpetuated, characterised by requests for practical assistance in averting misfortune, in return for offerings and a continued recognition of the deceased. This relationship was celebrated at the 'festival of the valley' with feasting at the site of relatives' tombs (Baines 1991: 147). Individual requests to the dead were addressed to both specific people, in addition to the collective dead population (Baines 1991: 152). The living held the dead responsible for a variety of misfortunes,

accepted as punishment for misdemeanour (Baines 1991: 151-152), as the dead could assert their influence over the living in positive or negative ways.

A number of textual references have been summarised in the table below as they provide examples of 'unofficial' responses on the part of individuals in the attempt to avert or rectify aspects of misfortune. They are particularly relevant for their references to illness.

Title	**Date**	**Provenance**	**Content**	**Principle sources**
Letters to the dead	Throughout Dynastic period	Miscellaneous	Requests to the dead for assistance	Gardiner and Sethe 1928
3h iḳr n Rᶜ stelae	New Kingdom	Deir el-Medina	Requests for intercessions from the dead	Demarée 1983
Amuletic decrees	New Kingdom	Miscellaneous	Prophylactic protection from illness and accident	Edwards 1960
Divine intervention	New Kingdom	Deir el-Medina	Requests to the gods to implement punishments or to alleviate suffering	Borghouts 1982 Morschauser 1991 Demarée and Janssen 1982

3.1. Letters to the dead

Based on evidence from throughout the Dynastic period, 'letters to the dead' comprise rare examples of individual responses to misfortune, including illness. The examples that have survived are perhaps not strictly sources of non-elite evidence by merit of their location in tombs and their content describing inheritance disputes. They have been included here as indicators of the nature in which the boundary between living and dead was transgressed in times of misfortune. It is probable that the non-elite, deprived of access to the literary record, resorted to oral invocations when faced with dilemmas (Meskell 2002: 187).

The wide geographical dispersal of the 'letters to the dead' perhaps implies a generalised practice, where unfavourable evidential survival rates may account for their rarity. The requests were frequently inscribed onto offering bowls, and deposited at tombs, indicating the nature of the reciprocal arrangement and the continuation of familial relationships and duties beyond death (Gardiner 1935: 24). A comparable ritual of libation at family tombs has been attested from early 20th

Century Nubia (Blackman 1916: 31-32), perhaps suggesting an enduring tradition. The under-representation of non-elite burials in the archaeological record contributes to the dearth in associated ancillary activities. If they were indeed as scarce as the data suggests, we may be observing limited literary examples of an oral tradition, circumscribed by restricted access to the tangible means of personal expression. As if to support this supposition, the letters were frequently denoted as 'oral reminders' (Gardiner and Sethe 1928: 1). Amongst the constituents of the recorded misfortunes were concerns with matters of inheritance, the pragmatic demands of which required the deceased to solve complications instigated by their own financial arrangements before death. The actual documentation of these requests, as opposed to oral renditions, may have developed from the involvement of a scribe in recording additional aspects of the case, or even as part of a 'legal service' devised to alleviate complications.

The 'letters to the dead' habitually portrayed feelings of genuine bitterness at a matter of perceived unfairness, describing personal plights and providing an insight into the potential reality habitually obscured by the usual platitudes expressed through the textual media. They maintained a conventional style, despite their subject matter, due to the formality of scribal involvement (Gardiner and Sethe 1928: 2), and perhaps in recognition of their enduring funerary context. The writer often expressed mystification as to why their deceased relation would permit such an injustice to occur, and frequently called upon a combination of dead family members for additional support. The perceived perpetrator of the misfortune could be either living or dead, but if still alive it was believed that they were not acting under their own volition, but rather that they were being influenced by a malevolent dead person (Gardiner and Sethe 1928: 7; 11). The proposition of activating the law from beyond the grave illustrates the blurring of the boundaries between the living and the dead as an ancient Egyptian concept. Illness prompted requests for assistance where, for example, a wife appealed to her dead husband to alleviate a servant's incapacity (Gardiner and Sethe 1928: 7-8), demonstrating the conviction that the maid was sick as a result of the dead husband neglecting his role and duty in protecting his household. Although this is an isolated example of the dead as perceived causative agents of disease, it closely resembles references in the medical papyri to the same

supposition (for example: Ebers cases: 1; 2; 99; 131; Ghalioungui 1987: 9; 10; 33; 42).

3.2. *ꜣḫ iḳr n Rᶜ* stelae

New Kingdom examples of *ꜣḫ iḳr n Rᶜ* stelae, identified to date, originate from the settlement site of Deir el-Medina. Dedicated to the deceased members of family groups (Demarée 1983: 279; 282), they possibly represent a progression from the 'letters to the dead', in referring to the advantageous proximity of the deceased to the gods and their consequent ability to interact favourably. Their content demonstrates the incorporation of standardised offering formulae, concentrating upon the deceased in their position as an 'able spirit' and their ability to provide general assistance (Demarée 1983: 283). Although less specific in their requests than the 'letters to the dead', similarly, wishes and expected intercessions were anticipated in return for offerings (Demarée 1983: 284). The stelae provided a permanent, interactive focal point for communication with the dead, possibly located within a household niche as a convenient receptacle for offerings (Demarée 1983: 286). The domestic positioning of the stelae possibly indicates the practices of a settled community intent upon establishing a concept of an ancestral home, or conversely as a transportable reminder where future abode and the sanctity of the tomb constituted uncertainties. Not all members of the workforce at Deir el-Medina were entombed within superstructures (Meskell 1999: 163) and the consequent anonymity of their final location of internment perhaps prompted the provision of an independent, tangible shrine.

3.3. Amuletic decrees

New Kingdom and subsequent evidence demonstrates a prophylactic approach to illness focusing upon the perceived protective properties of amuletic decrees. These comprised texts on rolled papyrus, accommodated within a decorative container, probably worn as a pendant. No examples have been found *in situ* to confirm this proposition (Edwards 1960: xviii), but it is possible that the mummification procedure involved the removal of amulets worn during life, as their properties were redundant. It would appear likely that the text was intentionally concealed, perpetuating the perceived 'spiritual' value of the existence of the written word independent of active recitation (Edwards 1960: xix). The decrees constituted undertakings by the gods or oracles to protect the wearer, demonstrating the perceived source of ailments

(Edwards 1960: xxi), comprising a more comprehensive inventory of protective powers when compared to the oracular names in habitual use (Baines 1991: 178).

The amuletic decrees might be expected to suggest a prioritisation of concerns within society although it is not possible to clarify the criteria for inclusion. Diseases were mentioned very frequently, either specifically or generally:

'We shall keep her safe from every [kind of] death, from every [kind of] illness, from every [kind of] accusation.....' (Edwards 1960: 3).

Recurrent references to leprosy and blindness were recorded, in addition to injuries caused by snakes, scorpions and crocodiles (Edwards 1960: 2; 16; 65; 14; 32; 53), with an isolated reference entreating protection from a wall collapse (Edwards 1960: 23). It can only be assumed that these incidents represented common occurrences during daily life, warranting specific precautions. There is little supporting evidence for the existence of leprosy from the human remains evidence, or the medical texts (Ebers case 877 remains an unsubstantiated example of leprosy. Ghalioungui 1987: 255-256), but this could reflect evidential survival and interpretative complications in lexicography respectively. Accurate translations for numerous conditions and treatments require substantiation before a comprehensive appreciation of the diseases most problematic to the ancient Egyptians can be appreciated. References to eye conditions and specifically blindness in the medical texts were numerous (for example: Ebers cases 336-431. Ghalioungui 1987: 102-124), perhaps reflecting an anticipated prevalence in conditions. Snakes and scorpions would have posed a continual hazard to those involved in outside activities. The treatments for snake bites warranted a papyrus dedicated to the subject (Sauneron 1989) and the presence of scorpion magicians on expeditions (for example: Gardiner *et al* 1952-55: 209) exemplifies concern. The perils listed in the amuletic decrees provide an insight into the realistic fears of the population, contrasting dramatically with for example, the artistic representation, in a funerary context, of scenes of 'daily life' that, for ideological reason, exclude references to potential hazards.

3.4. Divine intervention

Textual evidence from Deir el-Medina demonstrates recourse to divine intervention, as a device for perpetuating justice. Examples include the restitution of stolen goods and an admission of a lie. Most significant is the stela of Neferabut acknowledging blindness as retribution for falsity (Borghouts 1982: 7; Demarée and Janssen 1982; Quirke 1992: 135-136). The concept of physical affliction as castigation for misdemeanour was echoed in the 'Instruction of Amenemope', an ethical code that advocated punishment by the gods for human transgressions (Lichtheim 1976: 152-160). This concept of the punishment of violations with physical misfortune is further attested by the literature detailing curses. Whilst curses could take a protective form in terms of amulets, decrees and incantations, they could also threaten punishments for a breach in agreement or stipulation in relation to the material protection of, for example, inscriptions, tombs and property. Punishments included a reduction in life span and death due to hunger, thirst and disease (Morschauser 1991: 91; 92-93). It would be expected that a fatalistic environment would engender a comprehensive relationship between cause and effect, where a failure in social commitment would prompt an adverse reaction. The crucial aspect of *Maat* focused upon the fulfilment of social duty, an individual responsibility that would be interrupted by the onset of disease or injury, which perhaps emphasised a positive relationship between conformity and health.

To summarise, the textual evidence for aspects of 'domestic religion' indicate an individual response to misfortune. How the isolated examples relate to the wider non-elite community of Dynastic Egypt with no access to scribal skills will remain unsubstantiated, by virtue of their illiteracy. The existing sources highlight the enduring relationship between the living and the dead in terms of misfortune management and the role of the gods, in the form of decrees and intervention, in distributing and alleviating misfortune and disease. The decrees provide further details as to the specific nature of these misfortunes and list a number of diseases that formed a focus for apprehension within society.

Chapter 4

'Literature'

A number of literary and 'instructional' texts have been grouped together in this chapter as they provide indications as to the role of fate in maintaining social cohesion and the cultural response to misfortune and death. Various aspects of the responsibilities associated with social roles reflect both the divisions between the elite and non-elite in addition to their mutual dependency. An insight into the relative status of occupational role is provided by the 'Satire of the Trades', and the 'instructional' texts highlight the social response to abnormality and disadvantage. The manner in which both misfortune and death were perceived and recorded in ancient Egypt impacts directly upon our ability to assimilate and evaluate the social implications inferred from the textual evidence.

Title	Date	Key content	Principle sources
Instruction: Ptahhotep	6th Dynasty	Social cohesion and the ideal man as moderate, generous and honest	Lichtheim 1973: 61
'The dialogue of a man with his *ba*'	12th Dynasty	Attitudes towards death	Parkinson 1991: 132
'The tale of Sinuhe'	12th Dynasty	Life, death and social interrelationships	Parkinson 1997
'The shipwrecked sailor'	Middle Kingdom	Literary text focusing on the implications of an unsuccessful mission	Lichtheim 1973: 211
'The satire of the trades'	Middle Kingdom	Scribal exercise highlighting hazards of various occupations	Lichtheim 1973: 184-192 Parkinson 1991: 72
'Harpist's song'	18th Dynasty	Death and insecurity, endurance versus decay	Parkinson 1991: 145
Instruction: Amenemope	New Kingdom	Society's attitude towards disadvantage	Lichtheim 1976: 146
Loyalist teachings	New kingdom	Responsibility of the elite towards the non-elite	Parkinson 1991: 70
Instruction: Insinger	Late Period	Society's attitude towards disadvantage	Lichtheim 1980: 194

4.1. The role of fate and *Maat* in society and the concept of misfortune

A predominantly fatalistic approach to misfortune would potentially inhibit both attempts to rectify the negative aspects of existence, in addition to restricting their record. The concept of the ideal, depicted within a funerary context and intrinsic to the success of *Maat* and social balance, would be expected to exclude references to injuries, diseases and death as inappropriate subjects for direct reference in formal

texts. The perceived spiritual significance of the written word would contribute to the importance of this exclusion. Rather than avoid allusion, the textual references adopt a pragmatic approach to illness and death where, for example, the medical papyri and 'Book of the Dead' propose tactics for their management, as opposed to enlarging upon the associated fears and implications. Literary texts adopt a more direct stance towards misfortune, exploring negative connotations and adopting comparisons to highlight the favourable aspects of the condition being promoted. For example, trades are compared unfavourably to the scribal profession (Lichtheim 1973: 185-191), and death is contrasted to life (Parkinson 1991: 132-133). Although the evidence from the New Kingdom onwards suggests that fate was perceived to play a central role in the lives of the individual and the success of the community, it would appear that the dictates of destiny were challenged and counter-strategies were both developed and recorded.

There can be little doubt that fate was a potent concept, but ascertaining the extent to which control over individual destiny was an accepted phenomenon is problematic. An 'instructional text' highlights the significance of social cohesion, where individuals were encouraged to be moderate in their attitude (Instruction: Ptahhotep. Lichtheim 1973: 61) and consequently unquestioning in their acceptance of their social role. The textual evidence from the magical and medical papyri invalidates the notion of complete fatalism which would imply that misfortune, including disease and injury, were preordained and unchangeable, negating the value of these documents. The Ebers papyrus includes the following statement to be spoken on behalf of the patient: 'I am the one whom God wishes to keep alive.' (Ghalioungui 1987: 9), encouraging the success of the physician in curing the sufferer despite the fatalistic connotations of the illness itself. The concept of fate related directly to an individual lifetime, where length of life was prearranged (Hornung 1992: 55), and all aspects of existence were subject to destiny, including personality, career and cause of death (Morenz 1973: 67; Eyre 1976: 104). The all-encompassing nature of fate was encapsulated by its characterisation as a net (Kristensen 1992: 52; Hornung 1992: 208), perpetuating the concept of entrapping and controlling chaos, whether relating to fish, birds or society. Also further reinforced was the notion of interconnected destiny between the aspects of an individual's life and those of the community and environment, all united to preserve the balance of *Maat*. Mummification was

associated with binding and encompassing the integral parts of the body by bandaging and later with the incorporation of netting (Kristensen 1992: 50; 54). The exclusion of the non-elite from access to the mummification process perhaps promoted an elite concept of their being peripheral to ordered society, inhabiting instead the realm of chaos, and requiring repressive management together with the perceived evil forces and enemies that threatened the delicate balance of existence.

Perhaps we should avoid an over-estimation of the pervasive nature of fate as an inhibitor to the personal and social endeavours to avert misfortune. Counter-manoeuvres suggest a proactive stance, perhaps indicating the potential complexity and fractured nature of a society where restricted access to information must have prompted individual interpretations of formal concepts. The medical and magical texts discussed below (Chapter 5), demonstrate a systematic consideration of a range of conditions, documented presumably to perpetuate successful treatment methods. The genre of domestic religion, in the form of amulets, 'letters to the dead' and decrees, as opposed to 'official' temple ritual, centred upon safeguarding against the untoward (Chapter 3). The New Kingdom promotion of a greater individual humility, characterised by the concept of the 'truly silent man' (Lichtheim 1976: 147; Baines 1991: 194-195), was perhaps an attempt to reunite society in its acceptance of a fatalistic existence, designed to counteract the apparent expansion of domestic religious practices. Fate was clearly an important aspect of religious ideology, but it would appear that its potential to suppress the record of misfortune was limited, and our restricted view of non-elite health remains primarily hampered by literacy biases and elite perspectives.

The 'instructional' texts provide an insight into the social response to disadvantage. A complex attitude is demonstrated whereby individuals presenting physical 'difference' were not automatically excluded from society. The texts indicate a tolerance and even special treatment of a range of disabilities.

'Do not laugh at the blind man, nor tease a dwarf,
Nor cause hardship for the lame.

Don't tease a man who is in the hand of the god,
Nor be angry with him for his failings.'
(Instruction Amenemope: Lichtheim 1976: 160).

'The blind one whom the god blesses, his way is open.
The lame one whose heart is on the way of the god, his way is smooth.'
(instruction: Insinger. Lichtheim 1980: 194).

The concept of *Maat,* in addition to defining a basis for social balance and constraint, included a consideration for the needs of the disadvantaged (Hornung 1992: 141).

The literary sources provide an insight into the prevailing elite perceptions respecting the workforces. A predominantly pragmatic and exploitative approach is implied, with limited evidence for the provision for non-elite redress of inequity. The 'Loyalist Teachings' are illustrative of the dual responsibility encountered by the elite in their efforts to serve both the needs of the pharaoh and their non-elite dependants (Loprieno 1996: 546), also indicative were the selfish ulterior motives underlying a munificent attitude:

'Do not make the labourer wretched with taxes;
enrich him and he will be there for you next year.'
(Loyalist Teaching: Parkinson 1991: 71)

The evidence for the inclusion of the non-elite voice in socially significant situations is rare. Although the account of the 20th Dynasty tomb robberies (Peet 1930; Silverman 1995: 58-61) indicates an inclusive judicial system, we are reliant upon the Middle Kingdom literary text 'The Eloquent Peasant' (Lichtheim 1973: 169-184) to provide an example of a non-elite complainant. Whether this text constitutes an example of non-elite rights, or a literary device depicting an ideal, if unrealistic, scenario is subject to interpretative biases. Certain concessions would be necessary in order to maintain social cohesiveness and stability (O'Connor 1983: 194). Neither of these isolated examples can provide a reliable basis for appreciating the potential for non-elite atonement for social disadvantage.

4.2. Attitudes towards death

It might be expected that death as a subject was excluded from textual references as ill-fated and conflicting with the concept of an ideal existence. Contrary to the possibility that the ancient Egyptians might be hesitant in including references to the physical destruction that accompanies death, the texts reveal numerous observations on the process of decomposition (Zandee 1960: 14-19). The practice of mummification was a pragmatic response to the undesirable physical aspects of death, and the dead were incorporated in a continuing relationship with the living.

Textual evidence from the Middle Kingdom indicates the conviction that four factors interacted together to maintain cosmic order or *Maat*: the gods, the king, the 'favoured dead' and humanity (Baines 1991: 129). All factors were vital for the continuation of life on this earth and for success in the Afterlife. The dead constituted an extension of the living community (Baines 1991: 147), an arrangement reflected in the similarity between tomb and domestic architecture and facilities, and in the 'repeating life' status of the dead indicated on tomb inscriptions. The concept of the goddess Nut and her role in birth and death, as relating to day and night, could have supported the notion of life and death as part of the same re-occurring phenomenon. The ancient Egyptians had observed the state of sleep and the 'psychic reality' experienced in dreams and possibly equated this with the experience of being dead (Hornung 1992: 95). Documents relating to the interaction between the living and the dead certainly support the concept of a continuing active role within the community after death. Death was perceived not as an end, but as a continuation and life on earth was viewed as a temporary sequence preceding a divine existence in the Afterlife (Zandee 1960: 1).

Death would have constituted a frequent experience for individuals, families and communities in ancient Egypt. The average life span in ancient Egypt has been approximately estimated at between twenty-five and thirty-three years, taking into account the high neonatal mortality rate, estimated at 20% within the first month of life (Harer 1993: 20). The desert conditions that favoured the preservation of the deceased after burial would also have familiarised the living with death, as they re-encountered desiccated bodies during the reuse of burial areas (Gardiner 1935: 6). Members of the community would have frequently died unexpectedly from diseases

and injuries. Particularly hazardous was the event of childbirth, both for the mother and the new-born; the act of birth and the event of death was, in many instances, contiguous. A fatalistic environment might be expected to encompass an acceptance of this relatively short life expectancy, but the evidence discussed above (4.1.) indicates a reluctance to accept defeat unquestioningly. Clearly, death held an alternative significance not to be compared to our present day western perspective (Baines 1991: 133). It is tempting for us to assume that life must have been cheap, but alternatively death could have been promoted to a status equal or more important than life. Short life spans, notwithstanding their relativity, could focus the attention upon the Afterlife, relegating this life to an abbreviated interlude in the continuum. We, in our western civilisation, utilise our scientific knowledge and clinical expertise to prolong life, an option not available to other societies. As an alternative to striving to avoid death, the ancient Egyptians embraced it, focusing their efforts instead upon the physical preservation of the body, in the form of mummification, and in the material provisioning for the Afterlife.

Whilst the evidence from elite burials indicates that the importance of the Afterlife was paramount, it is difficult to assess how death amongst the non-elite was perceived (Kristensen 1992: 29). The Pyramid Texts indicate that the continuation of an actual life following death was a royal prerogative, later extended to members of the elite. The rest of society fulfilled a less specific role in the Afterlife, but remained in contact with the living through ancestor worship and 'letters to the dead'. Amulets placed in the tomb of the newly deceased were thought to act as protection from the older dead in the same cemetery. Scenes from the 'Book of the Dead' testify that all members of the community, and even selected foreigners, were granted access to the underworld as the 'blessed dead'. The 'place of destruction' accommodated individuals who failed the moral judgement and were condemned to non-existence (Hornung 1992: 99), indicating that eternal life was inclusive except for those eliminated by their own non-conformity, a cohesive society resulting in collective eternity. This avoidance of finality in death and the importance of maintaining *Maat* by individual efforts to conform within society, potentially implies that death whilst carrying out royal duties was commendable. Goedicke (1968: 29) suggests that a royal decree may have facilitated special arrangements for the burial of fatalities on royal expeditions although tangible evidence in the form of burials has not been forthcoming to date.

The ancient Egyptians attempted to overcome the finality of death by their preparation of the physical aspects deemed necessary for the Afterlife. To this degree, death influenced the conduct and achievements of an individual (Morenz 1973: 195). The 'Tale of Sinuhe' associated the transition between countries with the process of death and rebirth (Baines 1982: 43), thus emphasising the concept of the passing from the known to the unknown. The natural fear of death was reconciled with an expectation of perfection to come. The 12th Dynasty text 'The Dialogue of a Man with his *Ba*', describes the two contradictory attitudes towards death; the fearful unknown and the reassuring commencement of an ideal form of life after death.

'If you think of burial, it is agony;
it is the bringing of tears through making a man miserable;
it is taking a man from his house,
being cast upon the high ground....'

And subsequently:
'Death is to me today
like a well-trodden path,
like a man's coming home from an expedition.' (Parkinson 1991: 132-133).

Despite the preparations for, and anticipation of, the Afterlife, the ancient Egyptians were fearful of the uncertainty of the future and attached great importance to the geographical location of their burial as indicated in the 'Tale of Sinuhe' (Baines 1982). Even funerary inscriptions confirm that life on earth was the preferred existence:

'Thou who [wast] rich in people, thou art in the land that likes solitude. He who loved to spread his legs in walking is bound, enwrapped and obstructed. He who liked to dress himself in rich fabrics sleeps in yesterday's cast-off garments.' (New Kingdom tomb of Nefer-hotep. Morenz 1973: 187).

The 'harpist's songs' (Parkinson 1991: 145) imply that individuals were constantly aware that the enjoyments of life would end at death, contrary to the material tomb preparations that suggested a continuation of the most favourable aspects of this life.

As Baines (1987: 81) points out, the Old Kingdom tomb decorations, in particular, were more focused upon the activities and achievements in this life. Perhaps as a guarantee of a positive reception, the scenes constituted a form of recommendation, or simply provided the deceased with a record of past pleasures. Further justification for the enjoyment of this albeit transient life was attested by Herodotus (2: 78) (De Sélincourt 1996: 113). He documented an account of how at a party a man would carry, to each person in turn, an image of a dead person in a coffin and say: 'Look upon this body as you drink and enjoy yourself; for you will be just like it when you are dead.' This morbid performance may have been a late introduction, but the excavation of emaciated mummy figurines from domestic settings at Tanis (Lloyd 1976: 336) perhaps substantiates some form of ritual. Ideological and realistic contradictions are clearly illustrated by the vital importance of the provisioning for the Afterlife, as opposed to the practice of tomb robbery and destruction. There appears to have been a conflict between individual, selfish requirements and a lack of obligation towards others (Gardiner 1935: 33-34).

The ancient Egyptians demonstrated complex attitudes towards death, combining a fatalistic approach to abbreviated life spans with the anticipation of an active role in the Afterlife.

4.3. Satire of the Trades

The Middle Kingdom 'Teaching for Dua-Khety's Son' has been denoted the 'Satire of the Trades' although there is no evidence, other than the nature of the descriptive contents, to suggest that it were considered humorous in an ancient context. The tone of the text, evoking disdain for the various professions through the intentional use of embellishment in describing the negative characteristics would certainly appear to be satirical (Lichtheim 1973: 184). The text formed part of a literary genre of scribal exercises that promoted the scribal profession by denigrating alternatives and it is difficult to assess the degree of exaggeration incorporated into the portrayals, in the light of this intentional bias. In promoting the advantages in undertaking a scribal position, the favourable conditions associated with scribal duties are highlighted and compared to the disadvantages of other trades, suggesting an element of choice and opportunity for learning on an individual basis (Parkinson 1991: 72). The important

aspect of this text is to avoid literal interpretation, whilst appreciating that exaggeration contains an element of truth.

The 'Satire of the Trades' provides information about how the scribal profession perceived and categorised the various non-elite occupations, classifying them specifically in terms of the negative experiences inherent with the task (Meskell 2002: 58). Long hours, poor rewards and physical hardships personify the various occupations, where the descriptions emphasise the drudgery and indignity of manual occupations. The workers are compared to animals where, for example, the smith is said to develop 'fingers like claws of a crocodile' and the potter 'grubs in the mud more than a pig' (Lichtheim 1973: 186). An emphasis is placed upon the unsavoury appearance and smell of the workers where their task dictates their personal appearance and hygiene. A number of references are made to physical disadvantages resulting from occupational activity. These include the hardening of the epidermis on the hands of the smiths, a festering swelling on the neck of the gardener, swollen fingers for the farmer and smoke inflamed eyes for the stoker. Environmental details are also informative where, for example the reed-cutter is devoured by mosquitoes and gnats. Habitual postures adopted by the individual workers would have impacted upon muscular and skeletal fitness, aptly demonstrated by the illusion to general fatigue throughout the text. The specific reference to the weaver indicates the cramped position adopted by this profession where the following description aptly summarises the problem: 'with knees against his chest, he cannot breathe air.' (Lichtheim 1973: 188). Despite its satirical nature the text provides the basis for the documentary evidence of a range of tasks, highlighting occupational and environmental issues that in many instances are supported by alternative sources of evidence. These are condensed into table 5 (Appendix 1).

To summarise, the 'literary' texts contribute to our understanding of a range of ideological and philosophical issues surrounding misfortune and death. These are significant as they determine the manner in which references to diseases, injuries and fatalities entered the documentary record. The role of fate and *Maat* within society were crucial, both in terms of social cohesion and in the acceptance of physical 'difference', but ineffective in suppressing the record of misfortune. Contrary to expectation the subject of death formed a substantial genre. The concept of continuity

after death and the role of the deceased in the maintenance of *Maat*, was likely to have influenced the presentation of fatalities in formal texts, but 'literary' sources suggest a more individual and pragmatic approach to hazards. The ancient Egyptians were active in their attempts to avert misfortune with the use of decrees, amulets and applications to the gods and the dead (Chapter 3). However immutable they considered fate to be, a passive role was not accepted. This is relevant within the context of misfortune including illness, and involvement in hazardous occupations, as it highlights a determination to avert disaster wherever feasible.

Chapter 5

Medical texts

The medical papyri provide a catalogue of the range of diseases and injuries that confronted ancient Egyptian society. They also provide the basis for the interpretation of the perceived causes of, and considered treatments for, those diseases and injuries, both significant factors in the appreciation of environmental or occupational origins for the conditions. As with all textual references we are faced with the exclusive nature of the source in terms of literacy and the implied limited audience. With the medical texts, however, I consider that they provide a greater insight into aspects of the health of the non-elite workers than might initially be thought. The range of injuries cited in the Edwin Smith papyrus relate closely to the scope for traumatic accidents expected in heavy industry, such as quarrying or construction. The sector of the workforce most likely to be alluded to was, therefore, the manual labour force, the evidence for whom is so elusive in the majority of documentary sources. Within the social environment engendered by an elite perspective of the conscripted workforce preoccupied with ideological appearances and economic return, it is perhaps surprising that the non-elite would warrant attention for their injuries. Unfortunately, it is not possible to eliminate the potentiality that the desire for knowledge provided a catalyst for the compilation of a traumatology manual, as opposed to a demonstration of humanitarian altruism. Despite the confusing issues of target audiences and beneficiaries, the Edwin Smith papyrus in particular, still provides an insight into the range of injuries experienced and the recommended treatments.

The incantations and spells described in the 'magical' texts and the verso of the Edwin Smith papyrus frequently refer to protection of the household or community from evil plague-carrying demons and winds (for example: cases 14-18. Borghouts 1978: 14-16), with the potential to affect all members of the establishment. Even supposing the texts were designated for an elite audience, they demonstrate their humble origins, and provide an insight into the diseases that would have affected the elite and non-elite in varying capacities. It is likely that the texts represented the documentation of rituals and procedures embedded in the life of the community. The

socially diverse nature of the medical texts is demonstrated by the inclusion of gynaecological and obstetric sections (Von Deines *et al* 1958a), devoted to the female sector of society almost certainly excluded from the literate elite domain and yet represented comprehensively through their ailments. The 'Brooklyn' papyrus comprises descriptions of treatments for snake bites (Sauneron 1989), incidents that surely concerned those occupied in outdoor occupations in the fields, quarries and mines most closely.

The purpose of the medical and magical texts, in terms of practical use, remains unclear, in part due to the unsubstantiated contexts for the texts retrieved to date. The Ebers papyrus was purchased in pristine condition, possibly originating from a tomb context (Ebbell 1937: 11), and forming part of a reference collection (Parkinson 1991: 22). The only existing copy of the Edwin Smith text is incomplete indicating that it was probably not an official copy, reasons for its unfinished status naturally remain a mystery.

Twelve papyri detailing medical and traumatic conditions have been identified and translated to date (nine of the most informative are tabulated below). Most significant to this research are the Edwin Smith papyrus, unique and, therefore, vital to our knowledge of the ancient concepts of injury management and the Ebers papyrus that comprises a compendium of further works on general medical conditions and diseases. The Edwin Smith and Ebers papyrus constitute the basis for the majority of our current knowledge on ancient Egyptian medicine. In this capacity these two texts form the focus of discussion in this chapter. The Ebers papyrus takes precedence over the Hearst and Berlin papyri as they contain mostly comparative data. The Brooklyn snake papyrus has been included despite the comparatively late date of the surviving copy as it has been assumed that the composition of the original dates much earlier. The magical texts have not been discussed in detail, but the 'magical' content of the Edwin Smith papyrus have been included to indicate the nature of 'non-rational' medicine.

Standards of translation vary greatly, and early English translations, specifically of the Ebers papyrus, should be treated with caution (Bryan 1930; and to a lesser extent Ebbell 1937). Fortunately both versions have been superseded by more recent and

reliable translations in English (Ghalioungui 1987) and German (Von Deines *et al* 1958a; Westendorf 1999). The English translation of the Edwin Smith papyrus (Breasted 1930) remains the most comprehensive interpretation of the text, and subsequent German contributions provide substantiating and clarifying evidence where required (Von Deines *et al* 1958a; Westendorf 1999).

Title	**Date (approximate copy date)**	**Provenance**	**Content**	**Principle sources**
Edwin Smith	1550 BC	Not known	Trauma	Breasted 1930 Westendorf 1999, vol:1
Ebers	1500 BC	Not known	General medical	Von Deines *et al* 1955 Ghalioungui 1987 Westendorf 1999, vol:1
Lahun	1820 BC	Lahun	Gynaecology	Griffith 1898
Ramesseum 3,4,5,	1700 BC	Ramesseum	Gynaecology, ophthalmic, paediatric	Gardiner 1955 Barns 1956
Hearst	1450 BC	Not known	General medical	Reisner 1905
Chester Beatty 6	1200 BC	Deir el-Medina	Rectal diseases	Gardiner 1935
Berlin	1200 BC	Not known	General medical	Wreszinski 1909
London	1300 BC	Not known	Magical	Leitz 1999
Brooklyn	300 BC	Not known	Snake bites	Sauneron 1989

5.1. The Edwin Smith papyrus: the traumatic conditions

The Edwin Smith papyrus is unique for its content of traumatic injuries. It provides an invaluable insight into a range of injuries observed, diagnosed and treated within ancient Egyptian daily life. The text is particularly relevant to the question of occupational injury appertaining to either construction or military environments. The acute nature of many of these conditions leads one to suspect that the environment for observation and practice comprised a high level of manual activity and exertion. What is specifically apposite to this research is that, although the workforce was not the direct audience for the text, they were likely to have been the recipients of the treatment methods listed. Whether this situation also reveals a potentially humanitarian attitude towards the workers remains doubtful, but it certainly elucidates a proactive stance in terms of the structured handling of injuries and conditions acquired within the work environment.

Despite insufficient evidence to confirm hypotheses as to the purpose of the text, it would be expected that the injuries included were sufficiently frequent and problematic to warrant the composition of a specific treatise. Medical texts perhaps more accurately reflect the interests of the elite or the practitioners themselves, as opposed to the needs of society, an observation made with regard to the Greek and Roman treatises that predominantly ignore the substantial problem of infantile diarrhoea (Scheidel 2001: 65). Surprisingly, in ancient Egypt, aperients featured more frequently than references to the dysenteric conditions that must have been prevalent (Nunn 1996: 159), although translations are not secure. It should not be assumed that cases were selected according to frequency of observation, as alternative criteria for inclusion may have been apparent. The incorporation of cases with no treatment suggests that success in alleviating a condition was not the basis for selection.

The Edwin Smith papyrus is remarkable, when compared to the other medical papyri, for its methodical presentation and content. Whilst this unique status increases its interest, it renders interpretation problematic in the absence of comparable documents. The incomplete nature of the document frustrates attempts to draw conclusions about the extent of knowledge the ancient Egyptians possessed in the management of trauma. All reference to conditions relating to the lower body are absent, except when included to clarify symptoms of cranial and spinal injuries. The cases are arranged in an approximation to a descending order through the anatomical regions. Each case is divided into the title, examination, diagnosis and treatment. The titles of the cases have been listed in table 1 (Appendix: 1) to clarify the range and nature of the conditions cited in the papyrus.

The interpretation of the Edwin Smith papyrus has been subject to error, whereby its seemingly familiar and systematic approach to anatomy and physiology results in a misplaced sense of security and consequent misunderstanding. The process of translation provides an immense challenge, with the inclusion of numerous examples of unparalleled vocabulary. Unfortunately, Egyptologists, lacking in medical expertise, have relied upon indirect professional assistance, which although helpful invariably limits the interpretative options that would arise from the application of first hand knowledge and experience. Breasted admitted that his restricted knowledge of anatomy and physiology constituted a handicap when producing a translation of the

Edwin Smith papyrus (Ralston 1977: 116). The explanatory glosses included within the text indicate that misconceptions were a hazard even within an ancient context.

Modern anatomical and pathological labels have been ascribed to the text where there is no evidence to suggest that the ancient Egyptians applied the same terms or criteria and consequently translations can imply a greater knowledge than actually existed. Subsequently medical professionals, unaware of the uncertainties in translation, utilise the interpretations as a basis of fact upon which to comment from their angle of expertise. Misconceptions are perpetuated and compounded, a prime example of which is demonstrated by the skull fracture described in case 8 (Westendorf 1999: 718-720). Breasted (1930: 202) proclaimed that the symptoms detailed by this case provided evidence for the association, in ancient Egypt, between a cranial injury and post-cranial symptoms, whereas in reality it demonstrates how easily misapprehensions occur. Head injuries resulting in hemiplegia (or a less severe hemiparesis as described in case 8), almost invariably affect the opposite side of the body to the site of the cranial injury. Case 8 describes a hemiparesis on the same side as the injury. If the ancient physician had observed correctly, and made a connection between the original injury and the post-cranial symptoms, surely he would have cited the most common circumstances in the treatise. Occasionally, a phenomenon denoted *contra-coup* occurs, where the brain impacts against the opposite wall of the skull from the blow, resulting in brain damage and post-cranial symptoms on the same side as the original external injury. Obviously, it is not known how many cases the author of the treatise had observed, but it would be surprising if he had noted more cases of *contra-coup* than that of uncomplicated hemiplegia. A safer option would have been to mention both possibilities. Nunn (1996: 179) suggests the potentiality of a scribal error as an explanation for the confusion, in an attempt to make our knowledge correspond with the ancient data. Additional factors in the case are perhaps more enlightening, where the implications that the site of the original injury has healed and that the patient was walking with evidence of a slight paralysis suggest that the physician was seeing the victim some time after the injury had occurred. It could be that the two sets of symptoms were unconnected, but this cannot be determined without access to more details about the nature of the accident. We cannot be sure from the evidence that the ancient physician had observed that a cranial injury could result in hemiplegia, nor that he was familiar with the typical pattern of post-cranial

involvement. The misunderstanding arises from our attempts to credit the text with a depth of understanding that may not have existed: we prefer to attribute an error to the ancient scribe rather than abandon our conclusion-jumping.

The 'surgical' section of the Edwin Smith papyrus, detailing injuries, is not forthcoming about the traumatic causes. The circumstances surrounding the incidents were likely to have varied from one case to another, and the event would have had minimal impact upon the choice of treatment. This omission is perhaps unfortunate, as it would be interesting to appreciate the range of hazards that contributed to the list of injuries. Case 33 (Breasted 1930: 337-342; Westendorf 1999: 732) provides an exceptional insight into cause and effect, in its reference to a head-first fall resulting in crushed vertebrae. Unfortunately, the text was also predominantly silent concerning the potential magical influences, or the role of fate in the distribution and timing of accidents, an isolated exception alluding to an outside force in the form a god or death (case 8. Breasted 1930: 212; Westendorf 1999: 720). Other references to the concept of an external influence entering the body include a potential incidence of epilepsy in the Berlin Medical papyrus (Wreszinski 1909: case 99; col 8; lines 8-9) and a possible case of diabetes in the Ebers papyrus (case 197. Ghalioungui 1987: 60-61). Although conclusions should be cautious as translations for many of these conditions remains the subject of debate (Ghalioungui 1987: 60-61; Leitz 1999: 54), it is possible that fitting and loss of consciousness were associated with the concept of spirit possession. The absence of a significant external wound for the head injury in case 8 of the Edwin Smith papyrus may have led the ancient surgeon to attribute the symptoms to a similar instance of possession by a malevolent spirit. Alternatively, where consciousness was lost at the time of the injury, it is possible that the patient's resulting inability to explain the cause of the injury could favour magical explanations.

The majority of treatment methods listed in the Edwin Smith comprise instructions for the positioning of the patient and the preparation of applications and dressings, with guidelines for the reassessment and subsequent treatments required. These procedures are particularly informative in terms of the care that was received by members of the workforce in the event of their injury. It would appear that not only was a physician on hand to give instructions, but also that facilities were available for

the procurement and preparation of the poultices and their subsequent applications. Regardless of the resultant efficacy of the treatment methods, the Edwin Smith papyrus indicates the level of care and attention that the non-elite individual apparently received. An exceptional case (case 9. Breasted 1930: 439; Westendorf 1999: 720-721) combined a magical incantation with its treatment recommendation. Instantly dismissed as a '..curious hodge-podge of superstitions...' by Breasted (1930: 220), this case perhaps indicates how entrenched a spiritual approach to the management of aspects of misfortune. The presence of the 'enemy' inhabiting the wound (Breasted 1930: 439) suggests that despite an apparent and direct cause for the injury, the concept of evil forces prevailed. The 'enemy' may in this case represent an infection, or perhaps the location of the injury would prompt alterations in the level of consciousness giving rise to the notion of 'possession' mentioned above, and requiring a magical solution.

A more 'scientific' approach to traumatic conditions, demonstrated by the Edwin Smith papyrus, does not directly signify that the treatments prescribed were effective. Any compound fracture, without the advantage of antibiotics, would have been fatal in the majority of cases, as would any crush fractures to the chest, pelvic fractures and skull fractures penetrating the brain. The Edwin Smith Papyrus admits defeat in 17 cases out of the 48 recommending no treatment for the described conditions (Table: 2. Appendix: 1). These cases include a broken nose (case 11. Westendorf 1999: 721-722), in addition to a compound skull fracture (case 8. Westendorf 1999: 718-720), so a distinction must be made between cases where no treatment was deemed necessary and those where the prognosis was unfavourable. Although the text indicates the measures taken to avoid death where possible, some of the prescribed treatments were counterproductive. The incorrect positioning recommended for a patient following a head wound and skull fracture, with associated neck stiffness, for example (case 4. Breasted 1930: 432-433; Westendorf 1999: 714), if correctly interpreted, would result in further brain damage and, at worst, death. Other cases suggest that either no treatment was required or that none would be effective. Although the terminology used was the same in both instances, the ancient surgeon may have made a distinction, albeit inaccurately, between cases where no treatment would be beneficial, as the natural healing process would suffice, and those where the condition was fatal.

The ordered approach to injuries and their treatments, demonstrated by the Edwin Smith papyrus, indicates that positive efforts were made to avert the development and spread of disease and the complications of injuries. The text suggests a community zealous in its determination to protect itself from disease and systematic in its handling of injuries.

5.2. The Edwin Smith papyrus: the incantations and recipes

The verso of the Edwin Smith papyrus lists a number of incantations and recipes recommended for averting plagues and other unwanted situations. The data has been included as it provides complimentary evidence to the aspects of domestic religion listed above (Chapter 3.), particularly apposite in the detailing of the individual's or society's response to misfortune.

The spells and incantations, include descriptions of the perceived causes of disease (Table: 3. Appendix: 1), and supports the concept that a combination of demons, malignant spirits, gods and the dead were deemed responsible for patterns of distribution. Individuals who had been killed by crocodiles appear to have posed an increased threat to the living, perhaps reflecting a suspicion of those denied a standard burial. Domestic settings required protection from spiritual 'pests' or gods who posed a constant threat to the health status of the occupants. A comparable concept has been identified amongst modern *Beja* tribes in Sudan where children are considered particularly vulnerable out of the domestic precinct after dark (Jacobsen 1998: 150). Animals were identified amongst the list of causative agents of disease in the Edwin Smith papyrus. The habitual close association between animals and humans within the domestic setting would certainly have predisposed the transference of diseases (Chapter 10). Amulets representing particular animals were worn to endow the wearer with specific attributes, or as apotropaic protection (Andrews 1994: 60). Alternative characteristics to those of health issues appear to have influenced the styling of, for example, the fly amulet. Although associated with disease in the Edwin Smith papyrus, the fly was representative of honour and bravery in amulet form, where gold replicas were presented as awards (Andrews 1994: 62-63).

5.3. The Ebers papyrus

The Ebers papyrus constitutes the most comprehensive collection of medical cases out of the listed papyri and the cases are collated in table 4 (Appendix: 1). They demonstrate the range of symptoms facing ancient Egyptian society and the treatments warranting documentation. Despite the overall systematic presentation of cases in the original text, they remain difficult to group due to the occasional inconsistency. The categories adopted in table 4 (Appendix: 1) are based on a combination of those suggested in the *Grundriss* (Von Deines *et al* 1955: 115-133) and by Ghalioungui (1987) and serve to outline the scope of conditions included. A number of ailments and treatments cannot be translated due to a lack of comparative examples in other texts.

Unlike the Edwin Smith papyrus, it is not possible to speculate about the role of the non-elite as potential recipients of the recipes and formulae that comprise the treatments. Indubitably, the non-elite would have suffered the range of symptoms in common with the rest of society, but it is not possible to be more specific about the audience for the text. The cases include, gastric, respiratory, gynaecological, hepatic, blood and eye disorders, in addition to external wounds and bites. Cases 221-241 are particularly interesting, as they have been tentatively identified as referring to the condition of schistosomiasis, a parasitic disease that would have plagued workers in contact with the Nile and irrigation channels.

There has been a tendency, in previous studies of the medical texts (for example: Dawson 1924; Bryan 1930), to evaluate the efficacy of the ancient Egyptian method of diagnosis and recommendation for treatment by the philologist's contemporary standards. This practice is not only irrelevant, but also potentially misleading. Comparisons have been made between the Edwin Smith and Ebers papyri to the detriment of the latter. The Edwin Smith papyrus has been applauded for its apparently rational arrangement of cases, conforming to our modern-day criterion, in terms of order of presentation and systematic anatomical arrangement (Leake 1952: 10). But on closer examination, the definition of comparative 'rationality' for this reason is misplaced, where cases were catalogued in descending anatomical order, as opposed to our preference for either a functional approach to the classification of systemic disorders, or an alphabetical listing. Preoccupation with the ordered format

can distort a balanced and objective appreciation of the merit of text as a whole. The Ebers papyrus demonstrates a much more haphazard presentation when compared to the Edwin Smith, and has been taken less seriously due both to the arrangement of cases and to its frequent usage of magical phrases. Historically, scholars have tended to use the 'surgical' Edwin Smith treatise as a means by which to disqualify the remainder of the medical papyri as magical nonsense (for example: Dawson 1929: 74). It has been seen as a glimpse of rational thinking in amongst the miasma of irrationality. Quirke (1992: 111) identifies the use of incantations and spells amongst the treatment methods as recognition of the fact that 'healing cannot be confined to physical treatment but must extend to social communication as well, ...'. Whilst I accept this explanation, I would extend this concept and suggest that to dismiss the 'non-rational' is to overlook the ancient Egyptian belief system regarding health and the acquirement of disease and injury. It would be misleading to regard the Edwin Smith papyrus as more advanced than the other medical texts, based on its minimal utilisation of magical remedies, when the 'surgical' material constitutes a different set of problems and would tend to prompt more realistic and tangible responses and treatments. Fortunately, more recent translations of both the Edwin Smith and Ebers papyri adopt a more informed and less subjective basis for interpretation (Ghalioungui 1987; Von Deines *et al* 1958a; Westendorf 1999).

A study of the Ebers papyrus, in terms of drug terminology and orthography, states that the care taken with measuring and specifying prescriptions indicates that the ancient Egyptians possessed 'a higher degree of rationality and empirical thought than we have given them credit for.' (Weeks 1976-1978: 297). Because the belief system demonstrated by the text is alien to our present day thinking, the effort and precision inherent in ancient Egyptian *materia medica* has been discounted as misplaced. If, for example, we consider no amount of mouse fat to be beneficial for the treatment of joint stiffness (Dawson 1924: 84; case 658: Ghalioungui 1987: 172), then the concept of quantifying the prescription carefully has been denoted as further evidence of irrationality. This attitude disregards the ancient Egyptian belief system that promoted confidence in the efficacy of their treatments, and prompted a 'scientific' approach regardless of how misguided we believe the selection of the raw materials to have been. Animal fat provided the basis for numerous poultices for application in the treatment of joint disorders (for example: cases 657; 659; 677; 694: Ghalioungui

1987: 172; 176), where the recommended heating was likely to provide relief. The limited quantity of fat to be obtained from a mouse might be considered an obstacle, but the choice of animal was likely to reflect both this rarity value and the aspiration, on the part of the incapacitated patient, to the speed and agility that characterises its movements. It is perhaps misleading to apply literal translations to some of the substances suggested in the papyri. Where substantiating evidence from additional sources is absent, it is not possible to confirm that the ancient Egyptian intention was the same as our culturally biased interpretation. Other cultures might find our utilisation of the expression 'foxglove' to denote a specific plant and source of digitalis confusing, a literal translation would fail to convey our intention.

More recent studies have shown a greater appreciation of the ancient Egyptian approach to the less tangible treatments of disease (for example: Pinch 1994: 145; Nunn 1996: 97). This could be a reflection of our current cultural environment that recognises the limitations of science in supplying all the answers in disease management. We, in western society, are adopting a more holistic approach to conditions and in turn are more sympathetic towards the psychological aspects involved in ancient Egyptian healing techniques. There are comparisons to be made between the ancient use of amulets and current crystal therapy, for example, both of which attach healing properties to inert objects. The physical benefits of reducing stress and thus increasing levels of immunity are attested in trials using placebo drugs (Nunn 1996: 97). The role of magic in ancient Egypt, reassuring patients by the familiarity of recitations and formulae however physically ineffectual, can be interpreted as fulfilling a comparable psychological function.

5.4. The perceived causes of diseases and injuries and treatment methods

The medical papyri provide a valuable opportunity to observe ancient practice, facilitating an identification of the comprehensive approaches adopted towards the management of disease and injury in ancient Egypt. A combination of magical and methodological systems was integrated to combat both the spiritual and physical aspects of infirmity. The perceived causes of disease, as elucidated by both the medical and magical texts, were diverse and predominantly intangible. The medical texts, in agreement with documents relating to domestic religion (Chapter 3), identify outside spiritual forces, including the dead, amongst the perpetrators of ill health. The

role of the dead in causing disease was clearly illustrated in the Ebers papyrus (for example: cases 1; 2; 99; 131: Ghalioungui 1987: 9; 10; 33; 42). This identification of a non-specific causative factor for diseases, where the aetiology is not understood, is understandable and in some ways can be compared to our modern day recognition of viruses and bacteria as causative factors behind the physical symptoms of diseases and infections. A full appreciation of how they operate is not always apparent, but both have imperceptible origins, manifesting themselves in physical indispositions. A distinction was demonstrated between the perception and management of direct, as opposed to indirect causes of disease. Direct or tangible factors would include traumatic injuries and they received systematic approaches in keeping with their evident causes, whereas insidious symptoms were attributed to spiritual sources including fate, gods and demons. A dual approach to healing, attending to the physical symptoms and appeasing the malevolent influences, was thus a natural response to the perceived circumstances. Other 'traumatic' conditions including scorpion stings, snake bites and crocodile attacks were subject to preventative measures in the form of amulets, and complex magical treatments (for example: Borghouts 1978: 59-85; 91-97; Leitz 1999: 3-50; 85-92) despite their tangible causes. This was perhaps due to the association of the dead with the cause of these misfortunes, rendering magical solutions appropriate.

It has been suggested that reference to the perceived spiritual causes of disease cite archaic terminology for intangible influences, but the diversity of ancient Egyptian vocabulary for causative agents suggest otherwise (Pinch 1994: 141-142). It would be misleading to suggest that the authors of the medical papyri possessed a greater understanding, whilst choosing to limit their explanations to traditional expressions. The dichotomy appears to arise from the fact that both a 'scientific' and 'magical' approach to treatment existed contemporaneously. It is not surprising that a greater confidence was exhibited in the handling of trauma as opposed to disease. The cause of the injury is often apparent and physical, dispelling confusion in diagnosis. A high frequency in the occurrence and handling of injuries would lead to a greater understanding and advancement in treatment methods. For example, the 'pin and plate' method of setting a broken ankle was developed, in the 1950s in Switzerland, in a direct response to the frequent incidence of skiing injuries. The Edwin Smith

papyrus may possibly have been composed due to the pressure imposed by the prevalence of occupation-related trauma.

By attributing magical forces as the causative factors of diseases, and possibly also of injuries, the ancient Egyptians inhibited the potential development of an understanding in aetiology, that would have contributed to their success in health management and treatment. It is, perhaps, unreasonable to raise this criticism when western society only resurrected an appreciation of this science within the last two hundred years.

The treatment of illness incorporated two approaches; incantations were utilised to suppress the evil spirit or perceived causative factor of the disease, and drugs were applied or taken to repair the damage inflicted. The first line of defence involved pacification and protection, incorporating magical aspects of preventative medicine and healing, specifically manifested in the form of *heka* power (Kristensen 1992: 34-37; Quirke 1992: 113). More tangible objects of protection included, for example, amuletic decrees (above: 5.2.3.), and c*ippi* for their more specific perceived anti-venom properties (Pinch 1994: 142-143; 144). Oracles operated as consultants in the divine approval of actions (Baines 1987: 88). A textual reference from Deir el-Medina indicates that human intervention was encouraged in the form of a 'the wise woman' (*rḫ.t)* who fulfilled a specific role within the community as a fortune-teller and advisor (Baines 1987: 93). An ostracon indicates a consultation concerning the death of two children (Borghouts 1982: 25). Pinch (1994: 140) suggests that the women concerned may have been active in identifying spirit possession, thus supporting the notion that demons were responsible for causing diseases. The magical texts support the notion that an intermediary was required to perform the rituals. Although documentation is rare, ethnographic evidence in Europe and the Middle East suggests that the presence of a woman designated with healing powers within a village community may have been a common occurrence (Borghouts 1994: 129-130), active both in determining a diagnosis and an appropriate treatment (Jacobsen 1998: 65).

The performance of rituals and recitation of incantations, detailed in the medical and magical texts, represent further defences against misfortune, where the utilisation of

specific raw materials magically imbued with protective properties further the concept of the beneficial properties of amulets and decrees. The magical formulae described on, for example, the verso of the Edwin Smith papyrus exemplify a proactive stance against the role of fate in the distribution of disease. Without an understanding of the actual causative agents of the disease, the treatments were suitably imaginative responses to the perceived magical situations (Table: 3. Appendix: 1). Comparable to the inhibiting influence that the role of magic exercised in the potential development of cognitive aetiology, it also restricted a full appreciation of the efficacy of treatment methods. Success was measured against the perceived destruction of the malevolent force, at the expense of a more methodological approach to evaluating the treatment's role in alleviating the physical symptoms, with potential applications in the management of other conditions.

The second line of defence comprised the tangible response to conditions once the preventative measures had failed, used in conjunction with the incantations, to create a holistic approach. Many treatments included in the medical papyri demonstrated the concept of like curing like where, for example, the use of excrement in the treatment of digestive disorders was perceived to encourage the elimination of the causative agents (Pinch 1994: 134). Ingredients for treatment recipes were selected from sources that characterised the desired attribute for a cure, aptly demonstrated by the use of elements of animals noted for their clear-sightedness in the dark, as a remedy for night blindness (for example: Leitz 1999: 64-65). Jacobsen (1998: 112) identifies, in his ethnographical study in the Sudan, a similar belief system or 'law of sympathetic magic', whereby the perceived causative factor in a disease is also used in the treatment. In addition, symbolic associations with the symptoms of the disease were utilised: for example, red tree gum is used in the treatment of schistosomiasis, as the colour is associated with the symptom of haematuria. The Ebers papyrus lists treatments for possible haematuria amongst its recipes (cases 49; 62; 99. Ghalioungui 1987: 22; 33; 35), although a definitive translation remains obscure. A number of the proposed treatments included a non-specific 'berry-juice' that although unconfirmed, potentially coloured the medicine fulfilling a comparable association of ideas. A number of the ingredients for recipes were difficult or time-consuming to procure, for example, 'gall of tortoise' used in the treatment of *leucoma cornea* (case 360.

Ghalioungui 1987: 108), possibly its scarcity contributed to the perceived efficacy. Our appreciation of the terminology incorporated is, however, far from secure.

To summarise, the medical texts indicate the range of diseases and injuries that featured within society. Their collation can be interpreted as the manifestation of concern and an endeavour to address the health issues of the time. Whereas the recipients of the treatments included in the Edwin Smith papyrus were likely to include the non-elite workforces, by the nature of the injuries, the Ebers papyrus is less specific. Although the diseases would have been common throughout the social strata, it is not clear as to who benefited from the treatments. The texts indicate that the perceived causes of the diseases included gods and the dead, with little reference to the environmental and occupational factors that would have certainly contributed. The treatments proposed combine both 'non-rational' and 'scientific' approaches to appease the causative agents and ease the physical symptoms.

Chapter 6

Trauma in artistic representation

It would be expected that injury would play a prominent part in the working lives of the non-elite, particularly when involved in manually intensive tasks such as quarrying and construction. Artistic representation in an elite funerary context provides an opportunity to appreciate the role and labours of the non-elite within the mechanical depiction of specific occupational procedures. There are no conclusive representations, amongst scenes published to date, of injuries associated with any occupation. The absence of evidence is partly due to the exclusion of the representation of heavy industry from the tomb walls for ideological reasons. In addition, exclusion was in keeping with the conventional portrayal of an ordered and efficient world, where injuries obtained whilst fulfilling duty would introduce a chaotic element. Even where specific injuries were characteristic of certain occupations, the signs of misfortune would have been intentionally masked to preserve the idealised image of the task. There are four artistic representations included within two scenes, identified to date, that require discussion as they have been interpreted as evidence for task-related injury and its management. Traumatic injuries are not clearly depicted but rather suggested by individual poses and procedures. The scenes are, therefore, subject to numerous interpretations, although unfortunately, the occupational hazard scenario has in some instances entered publication as fact (for example: Miller 1991b; Nunn 1996: 57; 179: 201).

Although traumatic injuries must have featured predominantly, as in any society involved in the range of occupations identified from ancient Egypt, the following scenes constitute the only examples, identified to date, of possible occupation-related trauma (and their classification as such is far from secure). They have been included as an indication of the type of injuries that would naturally occur in an industrial setting, and as points for discussion as to the various interpretative possibilities that artistic representations should provoke. The following scenes are illustrated amongst the figures in appendix 2:

6.1. Occupation-related trauma

Trauma	Occupation	Tomb	Location	Date	Reference	Figure
Foreign body in the eye	Tomb furniture construction	Ipuy	Deir el-Medina	20th Dynasty	Davies 1927: pl. 37	1
Shoulder dislocation	"	"	"	"	"	"
Injured foot	"	"	"	"	"	"
Knee injury	Soldier	-	Abu Simbel	19th Dynasty	Desroches Noblecourt *et al* 1971: pl. 4	2

6.1.1. *Ipuy tomb furniture construction scene*

The context of the representation in question is the 20th Dynasty (1186-1069 BC) tomb of the chief sculptor, Ipuy, at Deir el-Medina (Tomb 217) (Figure: 1). Ipuy in his role as chief sculptor represents a class of higher status individuals at Deir el-Medina, in his ability to channel resources and manpower into the construction of his own tomb, when compared to the majority non-elite craftsmen. The figures of interest in this scene pertain to the craftsmen themselves as opposed to the tomb owner. The scene is located on the north wall of the first chamber that provided an access point for family gatherings and offering rituals. Davies (1927: 35) identified an offering bench south of the entrance to the tomb, perhaps indicating that this constituted the physical limit of public access. The first chamber or 'chapel' is the only decorated room in the tomb (Davies 1927: 36) which may suggest a specific function or simply indicate the extent of completed work. Individuals that we classify as carpenters are depicted working on tomb furniture and experiencing what has been interpreted as occupation-related traumas. The 'injuries' sustained in the scene consist of; a possible foreign body in the eye, the management of a dislocated shoulder and a foot crushed by a mallet. All these injuries would be highly plausible, given the occupational context, potentially representing what was perceived as a typical and familiar situation. This scene is, however, unique amongst carpentry and other industrial scenes identified to date, suggesting a more specific message. If in conveying the 'typical' mental image of a carpenter at his occupation, the artist associated injuries with the task, more examples would be expected. It would appear that this scene adopted a personal tone. Additional scenes within the tomb use animals to add humour to otherwise serious and formal representations, for example,

the confrontation between a cat and a bird in association with mourning relatives (Davies 1927: 42), reinforcing the possibility of a more informal approach.

Miller (1991b: 9) suggests that this construction scene represented the artistic equivalent to the literary tradition denoted the 'Satire of the Trades.' (Chapter 4: 4.3.). The textual comments, concerning the hazards and conditions associated with occupations, were composed by the scribal elite with the intention of highlighting the disparity between the literary and manual occupations. Copies of the 'Satire of the Trades' have been excavated at Deir el-Medina (Lesko L. 1994a: 141) suggesting that the text may have been familiar to the craftsmen. The carpentry profession is described in the following manner:

'The carpenter who wields an adze, he is wearier than a field-laborer. His field is the timber, his hoe the adze. There is no end to his labor, he does more than his arms can do, yet at night he kindles light.' (Lichtheim 1973: 186).

Reference is also made to the carpenter's time consuming task in roofing a dwelling, which involves leaving his family ill provided for, whilst he is absent at work (Simpson *et al* 1973: 332). As the text only highlights the general fatigue, rather than specific ailments or injuries, no useful comparisons between the literary and artistic genres can be attempted. It would not be unreasonable to suggest that other similar texts may have existed with which the tomb decorators at Deir el-Medina were familiar, possibly indicating additional occupational misfortunes. I consider it unlikely that visual satire would be incorporated into a funerary context. If the tomb artist was adopting a critical stance against the fate of the carpenter, he was acting apparently in isolation and at the expense of Ipuy's own profession. The three pictorial events depicted within the scene under question are discussed below:

6.1.1.1. *Foreign body in the eye*

One of the craftsmen depicted in the scene has been described as undergoing treatment for a foreign body in his eye (Nunn 1996: 57). As more recent evidence suggests that eye injuries would have been a frequent occurrence amongst carpenters and stone masons working without eye protection, the proposed interpretation of this scene may be realistic, if ideologically inappropriate. Pterygium and blindness could

result if the condition were left untreated (Miller 1991b: 8-9). Observations from the desert villages of Egypt in the early 20th Century have noted the correlation between a high incidence of pterygia (approximately 3% of the population) and stone cutting (Kamel 1946: 558-9). A similar pattern might be expected within the carpentry trade as both occupations involve the fragmentation of raw materials under impact.

The medical papyri make no reference to surgical treatments for eye complaints (Nunn 1996: 199), a situation also noted amongst the 18th Century *fellahin* in Upper Egypt who used drops and eye baths for traumatic conditions without differentiating them from diseased eyes (Blackman 1927: 204). The Edwin Smith papyrus describes the symptoms and treatments for 27 cases of head injuries, but does not mention trauma to the eye specifically. There are numerous possible explanations for this. Eye injuries may have been rare and therefore omitted from the treatise, although this is unlikely in a society involved in quarrying, carpentry and stone cutting pursuits. Minor eye injuries, such as the removal of a foreign body, may have been treated by the patient personally, or by a colleague and not be significant enough for a mention in a medical treatise. Likewise the treatment may have been so simple that there was no necessity for a written reminder for the practitioner. Textual evidence from Deir el-Medina includes absenteeism as a result of eye disorders (Janssen 1980: 136), although no treatment is suggested (Chapter 2: 2.4.). The absence of any reference to eye injuries within the Edwin Smith papyrus perhaps calls into question the purpose of the text as a hand book, or first aid manual, utilised by physicians involved in the treatment of industrial or battle injuries (Brandt-Rauf and Brandt-Rauf 1987: 69). There is little evidence, other than the nature of the contents, to support this interpretation. Whether occupationally related to construction or military environments, eye injuries would be expected to feature, as their prevalence in either circumstance would have been notable. Within either context, the absence of references to eye injuries in the treatise is surprising.

Unlike the Edwin Smith papyrus, a section in the Ebers papyrus is devoted to conditions of the eyes (Krause 1933: 266-270; cases 336-431: Ghalioungui 1987: 102-124), including one reference to trauma (case 337: Ghalioungui 1987: 103), where the recommended treatment includes the application of honey and a bandage. The inclusion of both traumatic and medical treatments within the same papyrus

possibly indicates an exclusively medical approach to their handling. Because we distinguish between surgical and medical conditions it is tempting to apply our criteria to the ancient sources. Although the Edwin Smith papyrus appears to be 'surgical' by our standards it is not known how the conditions were actually categorised. The specific ailments, included in the Ebers papyrus, are difficult to identify, but the treatments consist of external medicinal applications, including dark grey galena (lead sulphide) and green malachite (copper carbonate or hydroxide) eye paints (Lucas 1962: 80). It is possible that the copper could have possessed anti-bacterial properties (Nunn 1996: 199). Lane (1860: 576) when advising travellers to Egypt, in the 1830s, recommended a copper sulphate solution as a beneficial eye application for the treatment of ophthalmia, indicating that the tradition has been an enduring one. Eye specialists, *swnw ir.ty,* have been identified from as early as the Old Kingdom (Krause 1933: 259-260; Ghalioungui 1983: 44) denoting a need to address the problems of eye diseases and possibly also injuries.

The nature of the proposed eye complaint in the Ipuy tomb scene is unclear, as it is indicated only by the actions of a fellow worker, who is holding the patient's chin and applying a stick, to the eye area. Davies (1927: 69) interpreted the scene as a depiction of a kohl-painter attending to the craftsman and compared it to the contemporary (1920s) situation where barbers plied their trade whilst their clients were supposed to be working. Miller (1991b: 8) objects to this description as he considers the activity unbecoming for the workplace. It may also be inappropriate for a tomb context unless the procedure was a regular occurrence and analogous with the image of carpenters at work. The eye application may have constituted a preventative measure to protect against injury or to reduce irritation from dust and the sun's glare. The unique nature of the scene discourages convention as an explanation. It is probably not helpful to attempt comparisons between this artistic representation of the cosmetic sticks depicted with those identified from an archaeological context (for example: Miller 1991b: 8), where relative sizes were subject to artistic conventions and actual examples vary widely. For example, 18th and 19th Dynasty cosmetic sticks in the Petrie collection range in length from 5.1cms-17.8cms, a number of which, amongst the shorter examples, possess square bases, thought by Petrie (1927: 28) (UC 7898-7900) to be attachments for handles. The overall length of the stick would thus be increased by an unsubstantiated amount.

Miller (1991b: 8) describes the patient's position as 'braced' as if awaiting a traumatic event. I would consider the posture unsatisfactory if a foreign body were being removed, as the patient would have to be motionless to facilitate a swift and accurate manoeuvre. The patient would be more comfortable sitting, rather than kneeling precariously on the step, and with his head the right way round. The craftsman's hands remain positioned upon the column he is shaping. Perhaps it was the intention of the artist to render the occupation and its associated hazard absolutely clear, a detail that would be lost if the position of the figure were altered. The modern treatment for a foreign body in the eye, if lodged in the cornea, is to make a small incision with a sharp pointed object and remove the fragment, a similar concept to the removal of a splinter from the skin. Miller (1991b: 8) states that the risk of infection if not excised swiftly is high, and puts forward the hypothesis that an arrow is being used as an instrument. Arrows from the tomb of Tutankhamun vary in length from 14.5cms-95cms (McLeod 1982: 55) and could, therefore, be a suitable length to correlate with the depiction. I would suggest that if these eye injuries were regular occurrences, that a more appropriate instrument would have been developed, although specialist knives for eye operations were not introduced into Europe until after 1700, when eye surgery became a specific area of medicine (Bennion 1979: 137).

Unfortunately, the bulk of the figure operating the stick is missing, otherwise additional equipment or even mode of dress might indicate his activity more clearly. Davies (1927: 69) identified the objects depicted above the practitioner's head as follows:

'.....a double tube of eye-paints with the little rod of hematite slipped into its groove, a bag of dry powder, a little phial(?) of water for mixing, and a wicker case which holds all.'

New Kingdom kohl pots were constructed from reed or wooden tubes, bound together (Petrie 1927: 26-28). Individual tubes held specific compounds, some with ascribed medicinal functions, their pattern of use perhaps corresponding to the season marked on the exterior of the tube denoting the appropriate treatments required for eye diseases at different times of the year (Stead 1986: 53). The seasonal nature of ophthalmia epidemics has been identified, their incidence correlating with the height in temperature and the corresponding number of flies (Feigenbaum 1957: 165-166).

On balance, it seems likely that the container, in the tomb of Ipuy, was intended to represent a kohl pot. Malachite and galena have been excavated from tomb contexts contained in linen or leather bags (Lucas 1930: 41), indicating that this was possibly the preferred method of storage when the materials were not in use. The wicker case resembles those used in the New Kingdom as wig boxes (Killen 1994: 11), possibly supporting a cosmetic association, although similar containers were used to store a variety of materials. In the absence of any surgical instruments or their cases, it would be unwise to rule out alternative possibilities. The evidence does appear to suggest that Davies (1927: 69) was correct in his supposition that the craftsman was undergoing eye painting as opposed to a surgical procedure, but it is unwise to dismiss the process as purely cosmetic. I believe that the interpretation of this scene has been subject to the application of our concepts of treatment to an ancient scene, whilst attempting to match unrelated details.

6.1.1.2. *Shoulder dislocation*

A pair of figures placed in the top right hand corner of the scene has been interpreted as a representation of an attempt to reduce a dislocated shoulder (Nunn 1996: 178). It is probable that dislocations of this nature were common occurrences amongst manual workers as, although force is required for the initial injury, by falling or impact, subsequent displacements occur very easily, as the tendons holding the shoulder in place are permanently damaged. The modern procedure for shoulder reduction is called the 'Kocher' method and similarities between the initial stage of this procedure and the representation have been noted (Nunn 1996: 178). Although the representation of anatomical postures was subject to a range of stylistic biases and conventions, I would consider that the position of the patient in this scene is unsatisfactory, if the actions depicted were to convey their meaning successfully. The semi-prone attitude, with the head supported by the uninjured hand and elbow, would have been unsustainable, as it would inflict a painful pressure on the injured shoulder muscles. A sitting position with a lower back support would be preferable. The depiction may simply represent a craftsman pulling to his feet a reluctant resting colleague: the original interpretation by Davies (1927: 70). This explanation would be in keeping with other examples of colleagues encouraging each other to work harder (for example: Parkinson 1991: 82), and comply with the funerary ideology that

prioritised the portrayal of an ordered and efficient workforce easing over logistical complications.

The Edwin Smith papyrus does not refer specifically to any trauma associated with the shoulder. Case 34 entitled the 'dislocation of both clavicles' (Breasted 1930: 343; Westendorf 1999: 732) if correctly translated, represents the closest anatomical reference to the shoulder. I would question the accuracy of the identification of clavicle for this case, although it remains the favoured translation to date (Weeks 1984: 46; Westendorf 1999: 732). The strength of the clavicular joints makes dislocation difficult, especially at the sternum, as implied by the case description (Weeks 1984: 46), a break being much more likely for this fragile bone. The description of the shoulder hanging down (Westendorf 1999: 732) provides a further indication of a shoulder dislocation. I suspect that we are incorrectly anticipating a direct comparison between ancient and modern terminology. For example, *q ḥ* in referring to the shoulder also includes aspects of the joint and surrounding anatomical area within its description (Walker 1996: 71). Our misunderstanding of case 34 may be the result of an inaccurate translation. The treatment described includes reduction and binding (Breasted 1930: 344; Westendorf 1999: 732). Today, a sling would be utilised to immobilise the affected arm. If the translation were to be correct, it is puzzling why this unusual injury was included in the treatise whilst the more common dislocation of the shoulder was excluded, although our categorisation of injuries as 'frequent' may not correspond to any original concept. Until additional evidence becomes available, the meaning of this case will remain obscure. I suspect that once again we are attributing a modern procedure to an ancient scene, where there is no supporting evidence to suggest that the ancient Egyptians handled shoulder injuries in this way.

6.1.1.3. *Injured foot*

The depiction of the injured foot is also open to interpretation. If a foot accident was being depicted, then the artist included the cause and effect in the representation. We see the mallet positioned above the injured foot and the afflicted person raising his arms in the air in a gesture of pain and surprise. Alternatively, the 'injured' party may simply be gesticulating and calling to his colleague on top of the furniture. The pose is unusual, although a similar example can be seen amongst agricultural workers in

the mastaba of Akhethetep (Davies 1900-1. volume 2: pl. 7). The mallet could have been depicted in keeping with the convention where objects, lying on the ground, were shown in suspension to clarify their identity.

I would suggest that in the absence of further evidence, the scenes should not be interpreted as examples of occupational trauma, as the alternative possible explanations are too numerous and plausible. The fact that this is a standard representation that incorporates unusual details remains an interesting phenomenon.

6.1.1.4. *Summary of interpretation relating to the Ipuy carpentry scene*

The artistic representations, within a funerary context, constitute examples of self-expression within a generally standardised context, a concept of 'extending the existing' and achieving a lasting image based on significant aspects of reality. The introduction of anomalies that over-reach the laws of convention are naturally subject to scrutiny and interpretation and lead to questions being raised as to how the Afterlife was perceived by the tomb owner and his community. Any hypotheses regarding the significance of such deviations remain conjectural. The precision and formulaic approach, adopted with the tomb decorations in the Valley of the Kings, appears to contrast sharply with the rather flippant scene in question. It might be expected that given the opportunity to secure their own position in the Afterlife, the artists would adhere closely to the standards they exercised in a professional capacity. Possibly not understanding the significance of the scenes they were called upon to recreate in a royal funerary context, experimentation within the context of their own tomb may have been deemed to be hazardous.

Assuming that the artist was not intending to convey aspects of occupational trauma relating to carpentry, alternative suggestions for those intentions can be posed. Numerous examples exist of the introduction of unusual and humorous details into otherwise standard scenes, possibly included as a device that enabled the artist, within the restraints imposed by canonical representation, to personifying their work (Davis 1983: 138). This particular artist was likely to have belonged to the community at Deir el-Medina and his familiarity with the personal traits of his friends and neighbours would be reflected in his work. Ipuy, in his role as chief sculptor, was positioned to the right of the scene in question, where the craftsmen within his view

were depicted hard at work (Davies 1927: 70). Possibly Ipuy was demonstrating his success in controlling his potentially unruly group of workmen, suggesting a reference to the inherent symbolic significance of contending with chaos and promoting *Maat,* within his occupational field. This scene could represent an artistic version of the self-congratulatory tomb inscriptions, emphasising professional, in addition to personal value (for example: Lichtheim 1992: 49).

The archaeological evidence to date suggests that the community of tomb builders at Deir el-Medina were in an unusual position, amongst workmen, in having access to the materials and expertise required to prepare their own tombs. The emerging evidence from Giza indicates that funerary provision may have been an advantage enjoyed by the more elite participants of royal projects, although the degree of personal, direct involvement in their construction is difficult to evaluate. It has been considered (Bierbrier 1982: 18) that the workmen involved in constructing the private tombs at Deir el-Medina, were not the same individuals as those employed on the royal projects, but it would be surprising if professional expertise were not utilised in a private capacity. Whoever was ultimately responsible for the execution of the tomb scenes in question, the workmen at Deir el-Medina, unlike other non-elite sectors of society, could participate in the artistic culture otherwise restricted to the elite minority.

'The only chance those outside the elite had to participate in artistic culture was by imitating forms of their betters in materials and styles that were not appreciated.' (Baines 1994: 71).

The tomb builders were privileged in being able to mirror the elite funerary style closely, rendering it unlikely that any introduction of anomalies in terms of architectural style or decoration were intended to jeopardise their position. It is unlikely that the workmen at Deir el-Medina would be sceptical about the Afterlife, as it would challenge their perception of their activities in both a professional and personal capacity. Evidence from the settlement site at Deir el-Medina suggests that the workers supported the religious ideology in a domestic setting (Lesko, L. 1994b: 89; Friedman 1994: 95). It is more likely that we are witnessing the result of greater scope for personal expression and choice. The interpretation of the scenes is

problematic as the intention of the artist is, of course, unknown and we are influenced by our cultural environment into making observations regarding aspects of a personal nature, such as humour. Even if the artist were portraying occupation-related incidents of trauma, which is highly improbable, it would seem likely that his agenda differed from the intention of recording actual injuries. The focus of the scene related more closely to the successful role of Ipuy himself.

6.1.2. *Injured soldier at Abu Simbel*

There are numerous examples of the depiction of wounding and killing in battle and siege scenes, specifically adopted as decoration for temple walls in the New Kingdom, as statements regarding the power of the king and his success in defeating chaos and perpetuating *Maat*. These scenes do not depict injuries sustained by the Egyptians, as this would contradict the ideology and undermine the concept of Egyptian immutability in the face of chaotic influences. There is one scene, however, which has been interpreted as the representation of an injured soldier undergoing a leg examination by a battle physician (Nunn 1996: 165) (Figure: 2. Appendix: 2).

The scene is part of a complex representation of the battle of Kadesh, depicted within the large temple at Abu Simbel (Spalinger 1985). The Egyptian military camp is shown with the soldiers at ease. The 'injured' man sits on a sack whilst a colleague holds his foot on his own knee and examines that of the patient. The 'practitioner' appears to be inspecting the injured knee through some type of instrument, or perhaps holding a roll of bandage prior to binding the joint. Nunn (1996: 165) considers this to be an example of the battle physician at work, whereas Harer (1997: 271) prefers an explanation of examination or massage. There is no evidence with which to identify the role of the individual with that of a physician. Depictions of other individuals, shown in relaxed attitudes on sacks, perhaps indicate that the artist was portraying a calm and confident atmosphere, within the camp, as opposed to particular incidents. If this does indeed represent a knee injury, it is perhaps significant that the nature of the condition was mild when compared to the butchery represented in scenes of the enemy.

It would be expected that physicians were in attendance at battles. Four Middle Kingdom examples of physicians affiliated to the army have been identified

(Ghalioungui 1973: 73) and although their presence would be equally necessary during the New Kingdom, the evidence for this is, unfortunately, lacking. As would be anticipated, the human-remains evidence confirms the existence of battle trauma and fatalities, where cranial injuries appear to have been a common cause of death (Filer 1997: 61-63). There can be little doubt that the ancient Egyptians associated trauma and fatalities with battles, and in turn, with the soldier's occupation. Textual reference to the fate of the soldier, from the New Kingdom papyrus Lansing, details the hardships associated with dietary insufficiencies, disease and battle, culminating in death and burial in an unmarked internment (Lichtheim 1976: 171-172). Although the text, as a scribal exercise, is biased against alternative occupations it potentially provides a more accurate description of reality than the depiction of the battle of Kadesh. This particular scene, although constituting an isolated example, is interesting as it demonstrates a possible exception in a context where occupation-related trauma would have been recognised, but was not depicted for ideological reasons.

6.2. Surgical procedure

This circumcision scene has been included as the sole example of the artistic representation of a surgical procedure within a funerary context.

Procedure	Occupation	Tomb	Location	Date	Reference	Figure
Circum-cision	Youth – not specified	Ankh-ma-hor	Teti cemetery, Saqqara	6th Dynasty	Kanawati and Hassan. 1997: pl. 55	3

The tomb of Ankh-ma-hor, within the Teti cemetery at Saqqara, is dated to the 6th dynasty (2345-2181 BC) and contains representations that have been interpreted as depicting the surgical procedure of circumcision (Figure 3. Appendix: 2). The scenes are located in the doorway between rooms one and six and are to date unique in a funerary context. The Mut enclosure at Karnak temple, dating from the New Kingdom (1550-1069 BC), is the only other location in which a circumcision scene has been identified. The relationship between the tomb owner and the subject of the scenes is not known, as there is no evidence to suggest that the recipient of the treatment represented Ankh-ma-hor himself. The age of the patient is uncertain, but the depiction indicates youthful status as opposed to that of an infant. It is unclear

from the human remains sources, particularly those of the non-elite, what was the extent of the practice of circumcision throughout society. The evidence from the Predynastic site at Nagᶜ ed Deir suggests circumcision was a uniform occurrence, whereas mummies from subsequent periods were frequently not circumcised (Elliot Smith 1908). This could be due to geographical, social or temporal variations. The artistic representations of workers frequently show the individual to be circumcised, but within a funerary context, it would be unreliable to equate this directly with reality.

The reason for the inclusion of this scene within a funerary context remains obscure. The inscriptions within the tomb make no reference to any medical status for the deceased, nor does it indicate that he is the patient (Kanawati and Hassan 1997: 49). The individual carrying out the procedure is identified as the *ḥm kꜣ* or '*kꜣ* servant', which could indicate that circumcision was not under a physician's jurisdiction, but was performed by a priest (Kanawati and Hassan 1997: 49). The ambiguity of the inscription could facilitate an alternative explanation with the priest as the recipient (Nunn 1996: 170 referring to Roth 1991). This would allow for the presence of an unidentified physician performing the operation. In the ancient Egyptian funerary cult, the *ḥm kꜣ* was responsible for the preparation of the deceased for the afterlife. It was within his jurisdiction to ensure that all the requirements for the burial are fulfilled. Possibly, if Ankh-ma-hor was not previously circumcised, the scene may be depicting a specific aspect of this preparation.

Whoever the recipient of the procedure is, he is unlikely to be a member of the non-elite, so the relevance of this scene to this study is tenuous unless it is accepted that the practice of circumcision crossed the social divide. The scene has been included more specifically for an alternative interpretation that has been posed. It is possible that the scene depicts a surgical treatment for the condition paraphimosis (de Wit 1972: 41-48), an inflammatory condition likely to affect the non-elite in greater numbers than the elite due to their contact with dust and dirt during their occupational activities. Circumcision is required to prevent the condition from reoccurring (Kanawati and Hassan 1997: 49-50). If this interpretation is correct, then the scene depicts a surgical procedure being carried out in response to an acute medical

condition, as opposed to a ritual or initiation fulfilment. This would indicate an advanced understanding of cause, treatment and future prevention of this condition.

To summarise, the scenes denoted examples of 'occupational trauma' are subject to a range of interpretations. Alternative explanations and the funerary context of the Ipuy carpenter scene make it unlikely that this was an intentional representation of task-related injuries. The soldier at Abu Simbel is equally ambiguous. The circumcision scene is significant in terms of the common practice of the procedure either on religious or medical grounds.

Chapter 7

Anatomical abnormalities in artistic representation

Despite the limitations imposed by the conventions surrounding the depiction of the human form in a funerary context, it remains possible, in some cases, to hypothesise about the identity of representative examples of the visible symptoms of disease. The inclusion of anatomical defects within a funerary context, where order and balance prevailed in a perceived ideal world, can be tentatively identified as important indicators of a social or occupational position that transcended the significance of perfection. It is important to differentiate between the intentional depiction of abnormalities and conventional dictates or artistic error. This is not a straightforward procedure and individual examples are subject to different interpretations. The identification of the particular disease to which the abnormalities may relate is also complicated where a range of options exist, and attempts at establishing an occupational connection are thwarted where varying options for disease origins and patterns remain elusive.

Representations suggest that occupations and physical 'difference' were related in two respects. Firstly there are the abnormalities that could have been acquired as a direct result of the task, either through associated environmental factors or occupational activity. Secondly, it would appear that specific disabilities were associated with certain tasks but not caused by them, for example dwarfism and jewellers, and that deformity did not entirely negate social advancement.

A sample comprising the representations of anatomical abnormalities that appear to relate to specific occupations, have been tabulated below, and are included amongst the figures (Appendix: 2). The majority of the examples have been selected for their clarity and apparent intentional depiction of anatomical details. Other examples are more ambiguous, but serve as comparative data and points of discussion. The group of examples is not intended to be a definitive collection, but rather an indication of the range of interpretative possibilities.

7.1. Anatomical abnormalities with possible occupational origins

Abnormality and possible diagnosis	**Occupation**	**Tomb**	**Location**	**Date**	**Reference**	**Figure**
Hunchback - bursa or Potts disease	Gardener	Ipuy	Deir el-Medina	20th Dynasty	Davies 1927: pl. 28.	4
"	Serving girl	45	Giza	4th Dynasty	Cave 1939: fig 2: after Lepsius 1897-1913: pl. 27	5
"	Servant	Ti	Saqqara	5th Dynasty	Wild 1953: pl. 126	6
"	Not known	29	Beni Hassan	12th Dynasty	Newberry 1894a. 2: pl. 32	7
Genu recurvatum - congenital abnormality, poliomyelitis, rickets or trauma	Herdsman	Ptah-hetep	Saqqara	5th Dynasty	Davies 1900-1901. I: pl. 21	8
" "	"	Idout	Saqqara	Possibly5th Dynasty	Macramallah 1935: pl. 20	9
" "	"	Senbi	Meir	12th Dynasty	Blackman 1914: pl. 9	10
" "	"	Ukh-hotep	Meir	12th Dynasty	Blackman 1915: pl. 3	11
Abdominal protrusion - hernia	Herdsman	Akhet-hetep	Saqqara	5th Dynasty	Davies 1900-1901. II: pl. 17	12
" "	Potter	Amenh otep-si-se	Abd el-Kurnah	18th Dynasty	Davies & Davies 1923: pl. 8	13
Genital hypertrophy-schistosomiasis, hydocele or elephantiasis	Reed Gatherer	Akhet-hetep	Saqqara	5th Dynasty	Davies 1900-1901. II: pl. 14	14
" "	Reed gatherer, cattle herder	Ti	Saqqara	5th Dynasty	Wild 1953: pls. 110; 114	15 16
" "	Potter	Mehou	Giza	6th Dynasty	Ghalioungui 1962: pl. 3b	17
Genital hypertrophy and hernia - schisto-somiasis, hydrocele or elephantiasis	Netter	Mehou	Saqqara	6th Dynasty	Ghalioungui 1973: fig. 7	18

Abnormality and possible diagnosis	Occu-pation	Tomb	Location	Date	Reference	Fig-ure
Genital hypertrophy and abdominal distension - schistosomiasis	Boatman	Ti	Saqqara	5th Dynasty	Wild 1953: pl. 111	19
" "	Plucking birds	Pepy-ankh	Meir	6th Dynasty	Blackman 1924. IV: pl. 8	20
" "	Herdsman	Mehou	Saqqara	6th Dynasty	Ghalioungui 1962: pl. 3a	21
" "	Netting birds	Ankh-mahor	Saqqara	6th Dynasty	Nunn 1996: 93, after Capart 1907: pl. 39	22
Genital hypertrophy, abdominal distension and hernia - schisto-somiasis	Fisherman	Mehou	Saqqara	6th Dynasty	Ghalioungui 1962: pl. 3d	23
" "	Grain cutter	Mehou	Saqqara	6th Dynasty	Ghalioungui 1973: fig. 8	24

7.1.1. *Hunchbacks*

A further scene from the tomb of Ipuy at Deir el-Medina illustrates a gardener, with a hump on his cervical spine, operating a *shaduf* (Figure: 4. Appendix: 2). The artistic conventions dictated the incorporation of conflicting frontal images for the depiction of the shoulders and the chest. When an individual was occupied with activities involving the arms, the shoulder acquired an unnatural shape (Mohr 1943: 10-11). A differentiation is required between the recognition of the result of this convention and the intentional or accidental actions of the artist. The gardener in the tomb of Ipuy could be an example of a hunched back resulting from the positioning of the arms on the *shaduf*, but the head position is also significant in the overall pose. The eye patient in the tomb furniture building scene adopts a similar position, with the head reversed on the neck, but a smooth shoulder profile is maintained. Comparable gardening figures within the same scene were depicted involved in similar activities but maintaining straight backs, further suggesting an intentional portrayal of a deformed spine, as opposed to examples of the dictates of convention and artistic error (Mohr 1943: 62; Weeks 1984: 148).

There are many possible reasons as to why the artist would have included this anomaly, offering the potential for countless explanations that cannot be substantiated over the distance in time and through the complexity of cultural biases. The most likely explanation perhaps centres on the need to clarify the task of the individual, mirroring the observation that a proportion of gardeners in reality possessed humps and that the artistic representation would not be an accurate reflection of life without its inclusion conveying a 'typical' situation. Certainly it can be considered that the nature of the occupation is in no doubt and easily identified without this additional detail. A correlation has been identified between this illustration and the 'Satire of the Trades' (Miller 1991b: 10):

And the gardener is bringing a yoke,
each of his shoulders weighted with age,
and with a great swelling on his neck,
which is festering;
(Parkinson 1991: 74).

It is improbable that the artist was influenced by the description in the text, which appears to convey a condition more closely related to yoke carrying, such as an ulcerated wound resulting from the constant abrasion and pressure exacted by the load. It is noteworthy that both the artistic and literary genres, albeit that they are isolated examples, included an aspect of deformity in the representation and description of a gardener.

Accepting the gardener's hump as an intentional portrayal, there are at least two alternative diagnoses that might explain the deformity, excluding a congenital abnormality. To clarify this is significant in order to gain an understanding of the source of the deformity and to ascertain whether the origins of the causative disease were occupationally or environmentally linked. The health of the non-elite was directly related to their occupational activity and this scene provides the potential for understanding one example of that link. The repetitive movement and posture required in operating the *shaduf,* may have resulted in a bursa or scoliosis, similar to those documented with reference to London market porters (Miller 1991b: 10). The repetitive weight lifting action would affect the back of the operator, if the *shaduf*

were not counterbalanced sufficiently, a bursa developing on the adjacent side to the strain (Hunter 1978: 80-81). It would seem unlikely that a particular gardener would be operating a faulty *shaduf* for a sufficient length of time to produce a deformity of this nature. Alternatively, the repetitive swivelling action required in moving and depositing water with the use of a *shaduf*, even if counterbalanced correctly, may still have been sufficient to stimulate a bursa. An observation at a Czechoslovakian boot factory in 1947 noted that operators, required to make repetitive twisting actions of the trunk, developed bursae on their thoracic spines (Hunter 1978: 780). The 'Satire of the Trades' mentions that the swelling is 'festering', most probably referring to an ulceration of the skin, or representing a literary device to emphasise the discomfort. Alternatively, it could refer to the condition bursitis, where, with continued pressure or friction to the site of the bursa, consequent infection generates suppuration (Hunter 1978: 783-4). This gardener, if involved in carrying in addition to operating the *shaduf*, would be a likely candidate for this condition.

An alternative suggestion is that of Pott's disease, or spinal tuberculosis (Filer 1995: 30), which would also manifest itself as a cervical hump. A common complication is tuberculous suppuration, with a formation of an abscess (Nunn 1996: 73). Although perhaps correlating with the suggestion of 'festering' in the 'Satire of the Trades', the only reference to tuberculosis in the medical texts describes a possible tubercular gland situated at the front of the neck (case 860: Ghalioungui 1987: 235-236). Tuberculosis has been identified from the human remains evidence (Cave 1939: 149-152), although its prevalence is incalculable. The condition could potentially be associated with over crowded living or working environments, and/or infection from dairy products (Duerden *et al* 1993: 212-214), either of which pre-dispositions could have been present at Deir el-Medina. If the depiction were intended to convey a gardener with Potts disease, then his disease would be unlikely to relate to the circumstances of his present employment, although it may reflect his living conditions within the settlement at Deir el-Medina. Alternatively, the identification of a scoliosis would suggest an occupation-related deformity. Filer (1997: 61) has identified a 6th Dynasty gardener with fatal head wounds, suggesting that there were even more serious hazards relating to the task.

There are other examples of the artistic representation of hunchbacks. Their occupational contexts are varied, including a serving girl (Figure: 5 Appendix 2) and an animal handler (Figure: 6. Appendix: 2). The diversity of occupations and their varying level of physical exertion, favour the tuberculosis option. There is no reason to suggest, however, that all the hunched backs were symptomatic of the same condition. The example depicted in tomb 29 at Beni Hassan (Figure: 7. Appendix: 2), is shown in association with two individuals displaying the symptoms of poliomyelitis or rickets and *talipes equino-varus* (Nunn 1996: 79). I would suggest that the grouping of these deformed individuals positively confirms, in this case, the intentional depiction of abnormalities on the part of the artist. It is interesting that the artists chose (if that was indeed what they were doing) to depict certain individuals, from a variety of occupations, with hunched backs. It suggests that this deformity was a familiar sight and was, therefore, represented in a proportion of the artistic representations as a detail that clarified the role of the individual, in addition to his equipment and activities.

7.1.2. *Genu recurvatum*

There are four examples, identified within a funerary context to date, of herdsmen depicted with the possible condition of *genu recurvatum* (Figures: 8; 10; 11, and to a lesser extent: 9. Appendix: 2). It is also entirely conceivable, given that all four individuals were depicted in a similar stance, that a postural explanation would suffice. This 'deformity' was represented by the backward bend of the knee joint, a condition that is frequently a result of a congenital abnormality, but could also have been adopted by the artist to emphasise the stability required in walking when leading a potentially reluctant cow.

Hypothesising on an explanation founded in the intentional representation of a knee deformity, there are alternative diagnoses that potentially present a similar physical manifestation; including poliomyelitis (Weeks 1984: 96), or a less likely explanation of a traumatic injury resulting from a kick from the cattle (Blackman 1914: 33). The exact nature of the deformity is further complicated without the clarification of perspective in ancient Egyptian art as, although unlikely, *genu recurvatum* could also be *genu valgum* or knock-knee (Weeks 1984: 96). In this case, the deformity could equally be a result of poliomyelitis or rickets, the evidence for both of which is

confirmed by the human remains artistic and documentary evidence (Weeks 1984: 96-97). An 18th or 19th Dynasty doorkeeper, Roma, was depicted with either poliomyelitis, or clubfoot (Loebl and Nunn 1997: 454); the knee was, in this instance, shown with the correct alignment. A further example can be seen in tomb 29 at Beni Hassan (Figure: 7. Appendix: 2), where the legs were depicted apart, to emphasise the curvature of the right leg (*genu varum)*, in contrast to the overlap reproduced in the herdsman examples. '*Genu recurvatum'* was only depicted in association with the occupation of herding cattle, a potential occupational link that would not apply to poliomyelitis or rickets which would have been prevalent amongst all occupational groups, although the condition would limit the scope of the individual. Case 604 in the Ebers papyrus (Ghalioungui 1987: 159) recommends the application of a poultice and binding for support of an over-extended knee. I consider that the artistic representations characterise either *genu recurvatum* or, the over emphasis of a 'normal' posture, although the causative factor for any abnormal alignment remains obscure.

A traumatic explanation for the deformity (Blackman 1914: 33) remains a possibility. An injury resulting in the tearing of the posterior ligaments or from the abnormal hyperextension of the joint due to a blow would affect the alignment of the knee (Levangie and Norkin 2001: 361). Consequent hyperextension may be permanent. The uncertainty of the depictions together with insufficient circumstantial and ethnographic evidence render the identification of a specific occupational injury as the antecedent to this proposed deformity hazardous (Redding pers comm).

There are many examples of the representation of emaciated herdsmen, including two out of four of those with '*genu recurvatum'* (Figures: 10; 11. Appendix: 2). Fischer (1959: 249) suggests that the depiction of the emaciated herdsman was a satirical devise when adopted in conjunction with the depiction of other well-fed individuals. This does not explain why the occupation of herdsmen was utilised to demonstrate this comparison, when the well-fed examples originate from a variety of occupations. The malnutrition may relate to the characteristics of the *Beja* herdsmen (Blackman 1914: 33) as opposed to the hardship associated with the occupation. As this ethnic group only appears within this role, comparisons are incomplete. An alternative explanation for the emaciated state of these individuals is tuberculosis, in this case,

possibly contracted as the result of working in close proximity with the cattle. Any association between the knee deformity and tuberculosis must be cautious, as any joint involvement would more often result in fusion in a straight or flexed position as opposed to a hyper-extended one. Archaeological and ethnographic evidence suggests that cattle herding was a widespread but low status occupation, a life of hardship also indicated by the 12th Dynasty text 'The Story of the Herdsman' that refers to a group activity. The movement of the herd was regulated and not at the discretion of the herdsman himself (Goedicke 1970: 259), supporting the potential utilisation of low social status employees for this unskilled occupation.

Accepting for the moment the diagnosis of *genu recurvatum,* it has been suggested (Weeks 1984: 143) that the artists associated the phenomenon with cattle herders, and utilised the representation of this abnormality as a device for clarifying their role in society. If intentional deviation from convention was intended, it is possible that this resulted from the observation that the condition was prevalent amongst this group of workers. The attributes appear to transcend racial differentiation, applying to both *Beja* tribesmen and Egyptians, indicating that the artist associated the abnormality with cattle herding over and above the relationship to race. The condition does not occur in relation to any other occupation (although the record is not complete), but it would be hazardous to suggest that the abnormality was unique to cattle herdsmen. As the evidence in the following section concerning schistosomiasis (7.1.3.) indicates, the absence in depiction cannot be equated to absence of disease. The vast majority of depictions of herdsmen do not include this abnormality, perhaps suggesting the introduction of personal observation as opposed to any alternative convention.

7.1.3. *Schistosomiasis*

Parasite infestation causing schistosomiasis persists as a public health problem in Egypt today. The human remains evidence that has facilitated the identification of antigens, in addition to the calcified schistome ova, suggests that this debilitating condition was also prevalent in antiquity (Deelder *et al* 1990: 724; David and Archbold 2000: 153-161). It has been estimated that between 70 and 90% of the current male population, in Egypt, is infected with schistosomiasis. The incidence is higher in men than in women due to the agricultural nature of their occupations (Hicks 1983: 16). It might be expected that the parasite would have produced a

similar pattern of disease in ancient Egypt, affecting individuals involved in predominantly water-based occupations, with repeated infestation predisposing the host to anaemic conditions and vulnerability to additional diseases.

Standing water is the habitat for the parasite larvae (Miller *et al* 1993), rendering the banks of the Nile and the irrigation channels prime locations for infestation, as a result of occupational or domestic activities. The larvae enter the skin and eventuate in bladder, intestinal or liver infestation causing the characteristic symptoms of haematuria, abdominal distension and genital hypertrophy. Perhaps in keeping with these physical indicators of schistosomiasis, marsh fowlers, sailors, herdsmen and papyrus gatherers were, on occasion, depicted with a combination of hernia, abdominal distension and hypertrophy (Figures: 12-24. Appendix: 2). Their occupations may hold particular significance where the daily tasks would expose the individuals to repeated infestation from the contaminated water of the Nile and Delta, a situation that accelerates functional infiltration and determines physical anomalies. The tomb of Mehou at Saqqara includes varying degrees of abdominal distension, genital hypertrophy and umbilical hernia amongst fishermen and a grain cutter (Figures: 23; 24. Appendix: 2), although abdominal distension is more clearly accentuated in a depiction from the tomb of Ti (Figure: 19. Appendix: 2). The potential combination of symptoms suggests conditions of advanced schistosomiasis, including cirrhosis of the liver, causing ascites and genital hypertrophy. This set of symptoms were so prevalent in 19th century Egypt, that it was denoted 'Egyptian splenomegaly' (Ghalioungui 1962: 111).

Alternative diseases can account for a combination of the represented abnormalities, although it is the association of distension and hypertrophy (Figures: 19; 22; 23; 24, and to a lesser extent figures: 20; 21. Appendix: 2) that are particularly apposite to the manifestation of schistosomiasis. Abdominal distension and hernia alone are not conclusive indicators, but, when they were depicted in relation with genital hypertrophy, variable diagnoses other than schistosomiasis are limited (Ghalioungui 1962: 111). An alternative suggestion for the cause of abdominal distension has been obesity (Weeks 1984: 108). The development of a paunch whilst maintaining slim limbs is a characteristic of an active lifestyle but with a high carbohydrate diet. The association of the other symptoms in these cases makes this simple explanation

unlikely. Hydrocele or elephantiasis present possible explanations for genital hypertrophy (Figures: 14-18. Appendix: 2), both potentially prevalent in ancient Egypt, and the latter particularly common in hot climates (Keyes and Keyes 1903: 755-757). A reference to the treatment of hydrocele has been identified in the Ebers papyrus (case 866: Ghalioungui 1987: 243), indicating its recognition in antiquity. Although both conditions present possible alternative explanations, the absence of any notable oedema in the legs amongst the artistic representations supports the schistosomiasis diagnosis over these alternatives (Ghalioungui 1962: 111). Malaria represents another option, characterised by an enlarged spleen, resulting in a distended abdomen (Scheidel 2001: 81). In common with schistosomiasis, malaria has been identified from the human remains evidence (Scheidel 2001: 76) and its disease pattern would similarly be associated with water-based activities. In subsequent Egyptian history, soil excavation for the manufacture of mud-bricks resulted in a landscape pitted with water holes that encouraged mosquito breeding (Scheidel 2001: 84). Individuals involved in the manufacturing process would have incurred an increased risk of infection. Although numerous depictions of mud-brick manufacture and construction have been identified there are no examples, known to date, of the workers indicating relevant symptoms. It might be thought that if malaria were notably prevalent then the artist would include the associated anomalies in their depiction of the brick makers, in accordance with the water-based occupations mentioned above. The 'Satire of the Trades' mentions the hazards posed by mosquitoes and gnats to those occupied with reed cutting (Lichtheim 1973: 186-189), but, as would be expected, fail to connect any malarial symptoms with this perceived nuisance factor.

Schistosomiasis has been associated with the *âaâ* disease mentioned 28 times in the medical texts (Ghalioungui 1962: 111), although the accuracy of the translation is anything but certain (Ghalioungui 1987: 258). The symptoms described include abdominal pain and distension, and blood in the urine or faeces (Ghalioungui 1962: 111), indicating the potential for bladder or intestinal involvement. Ebers case 62 (Ghalioungui 1987: 25) refers to the presence of worms, not as a causative factor, but as a result of haematuria. The worm may represent the manifestation of an unpleasant external force, as opposed to a definitive causative agent, if parallels can be drawn with what we term 'parasite theory' (Ghalioungui 1987: 259; Grmek 1998: 243-244).

Perhaps more definitively, Ebers case 591 (Ghalioungui 1987: 156) refers to itching in the lower limbs possibly as a reference to the irritation caused subsequent to immersion in infested waters. The schistome worm is too small to detect with the naked eye but multiple infestations were likely to have been common (cases 50-61; 64-85: Ebers papyrus deal with various worm infestations: Ghalioungui 1987: 22-29). In the 1960s, in Egypt, 50% of those individuals with schistosomiasis also carried other worms. Some of those would have been visible, and, if a similar situation existed in ancient Egypt, the worms may have been observed by the sufferer during life, or subsequently by the embalmer during evisceration (Miller *et al* 1993: 54). Even if worms were detected, there was no reason for the ancient medical texts to associate them with the diverse symptoms of schistosomiasis (Grapow 1956: 65).

The evidence strongly suggests that schistosomiasis was prevalent in ancient Egypt. If the incidence of infestation were close to the estimated figures of today, then the majority of the population would have been infested. Occupations of all types would be expected to demonstrate a proportion of the workers with symptoms. It is interesting, therefore, that the artist chose to represent the symptoms amongst individuals with water-based occupations. Even the apparent exception, the potter, would have had contact with mud and water during his work. It may be that those depicted with symptoms contracted the disease earlier in life and hence reached the advanced stages whilst still employed. The average age for infestation is now 8 years (Hicks 1983: 16), but boys in ancient Egypt, possibly accompanying their fathers in their occupations, may have been exposed even earlier than this. It would appear that the artist specifically drew attention to the symptoms of schistosomiasis, often depicting the individual unclothed, for greater clarity. The details of genital hypertrophy were in several examples depicted on the outside of the leg (for example: Figures: 18; 20; 21; 23; 24. Appendix: 2). Weeks (1984: 113) concludes that this determination on the part of the artist to include these details, indicates a rarity value, and implies a correspondingly low incidence of the disease during the Old Kingdom. I would consider this to be a potentially inaccurate basis for assumption, as other Old Kingdom examples exist where individuals without symptoms were also depicted in this manner (for example: Duell 1938. volume 2: pl. 162), suggesting that artistic convention cannot be eliminated.

7.1.4. *Umbilical hernias*

Umbilical hernias were depicted as independent conditions, frequently associated with strenuous occupations (Weeks 1984: 109) (Figures: 12; 13. Appendix: 2), although ambiguous representations have resulted in the identification of garment details as swellings (for example: Ghalioungui 1973: 85). Hernias are common, often congenital, swellings in the umbilical area, resulting from a weakness in the muscle wall, exacerbated by lifting or other exertions in the abdominal region. They were prevalent in 18th century Egypt but considered incurable (Sonbol 1991: 10). The Ebers papyrus contains a section devoted to swellings (cases 863-877: Ghalioungui 1987: 239-256) including case 864 (Ghalioungui 1987: 240-241) that describes the standard diagnostic sign of an umbilical hernia, whereby the abdominal protrusion increases on exertion, in this example, when coughing. The treatment indicated by the treatise is unclear with no reference to the obvious solution provided by giving additional support to the abdominal region. The artist's inclusion of these anatomical details suggests that umbilical hernias, as a common phenomenon, were included within the representation of the human form as a typical physical characteristic.

7.2. Condition-related occupations

Textual references suggest that ancient Egyptian society demonstrated a favourable attitude towards the disadvantaged (Jeffreys and Tait 2000), although the 'Instructional' texts predominantly responsible for this interpretation were concerned with the portrayal of aspects of an exemplary existence. How this situation related to reality is difficult to qualify within an ideology that promoted the ideal in terms of balance and physical perfection. The evidence unquestionably appears to confirm that individuals with certain disabilities were associated with specific occupations, a situation reflected in the artistic representations from a funerary context.

A number of scenes show an apparent connection between occupation and deformity. This category differs from that above (7.1.) as the type of deformity is either hereditary or unlikely to have been caused by the occupation featured. The relationship between occupation and condition is thus reversed: the condition defines the individual within certain social and occupational roles. These scenes have been included as they confirm the existence of specific disorders and highlight the social

implications of their presence. The following table represents a selection of the numerous scenes that depict examples of blindness or dwarfism.

Condition	Occupation	Tomb	Location	Date	Reference	Figure
Blindness	Harpist	Nakht	Thebes	18th Dynasty	Davies 1917: pl. 15	25
"	"	Nefer-hotep	Thebes	18th Dynasty	Janssen and Janssen 1996: 61	-
Dwarfism	Jeweller	Ankh-ma-hor	Saqqara	5th Dynasty	Kanawati and Hassan 1997: pl. 40	26
"	Sailor	Anta	Deshasheh	5th Dynasty	Petrie 1898: pl. 13	-
"	Musician	Kai-aper	Saqqara	5th Dynasty	Fischer 1959: 250-51	-
"	Animal tender	Ti	Saqqara	5th Dynasty	Wild 1953: pl. 44; 76	-
"	Bearer	Uhemka	Giza	5/6th Dynasty	Kayser 1964: 37; 70	-
"	Attendant	Khety	Beni Hassan	11th Dynasty	Newberry 1893: 11; 61	-

7.2.1. *Blindness*

During and subsequent to the 18th Dynasty, harpists were repeatedly depicted with specific characteristics: they tended to be corpulent, bald, 'well dressed' and often blind (Manniche 1991: 99). Interpretative biases affect the understanding of the artistic representation of blindness where a differentiation between the depiction of a closed eye and the intentional portrayal of blindness is problematic. Only if the eye was open and the iris absent has the assumption been made that blindness was intended, although subsequent damage to the depiction is a factor for consideration (Manniche 1991: 99). Depictions did appear to intentionally omit the iris, for example in the mastaba of Mereruka (Duell 1938: pl. 95). Mereruka's wife is playing the harp for her husband and both husband and wife were represented with open eyes and no irises, although further depictions in the tomb show Mereruka with 'normal' eyes. I would suspect that artistic conventions complicate our recognition of blindness in these funerary contexts. What appears significant is the suggestion that blindness was an acceptable deviation from the 'perfection' deemed appropriate for the tomb owner and his relatives. Scenes from Amarna were more graphical in depicting deformed eyes (Manniche 1991: 99), a more realistic style that developed

potentially from an earlier genre, perhaps indicating the intentions of the earlier artists.

From a sample of sixteen depictions of suspected blindness, fifteen of the afflicted individuals were musicians (Weeks 1984: 140) (for example: Figure: 25. Appendix: 2). It is possible that their physical disability determined their occupation, as their condition was clearly not a result of their task. The suggestion has been made that a musician who was unable to view the audience, would have been advantageous in ancient Egypt, as in the royal harems of more recent times (Blackman 1915: 12-13). The identification of scenes including blindfolded musicians amongst temple reliefs at Karnak and Amarna (Manniche 1991: 100), suggest that the 'blindness' of the musicians was symbolic, or that the temple context was significant in the avoidance of the depiction of 'actual' disability. The musicians were required to entertain the gods, but in accordance with the rest of society, excluding the king, they were not permitted to see them. Their real or perceived blindness may result from an ideological constraint as opposed to the representation of an actual condition. Symbolic blindness has been associated with religious enlightenment and denied ocular access to the gods by a late Amarna prayer of Pawah (Spalinger 1998: 251), perhaps confirming this ideological concept.

If we are to accept, for a moment, that a proportion of the musicians were actually blind, it would appear that society accepted this disability and encouraged individuals in their pursuit of a musical career. In addition, the artists adopted this physical characteristic in their depiction of what was 'typical' about the appearance of a musician. This perhaps represents a clearer example of how these physical anomalies entered the artistic record to add clarity to the role of the individual.

There are numerous conditions that would predispose to blindness, although a degree of musical accomplishment may suggest a congenital or early affliction. Eye diseases and injuries were likely to have been prevalent in ancient Egypt, a number of which would result in blindness. A substantial section of the Ebers papyrus was devoted to eye diseases and more specifically cases 356-8 and 420 refer to the treatment of blindness (Ghalioungui 1987: 107-108; 122). Procedures included the application of the water from pig's eyes into the ear of the afflicted person (case 356: Ghalioungui

1987: 107), and although of dubious efficacy, indicate the recognition of blindness as a problem within society and possibly also the perceived point of entry for the disease. The association between the blindness of musicians and their frequent corpulence has resulted in further speculation as to causative factors. Weeks (1984: 114) has identified a specific form of corpulence amongst musicians and singers, which he explains as being related to their inactive lifestyles and rich diet in wealthy households. Those depicted additionally blind would have incurred an involuntarily induced reduction in their activity levels, and may have been suffering from a metabolic disorder that combines these two physical symptoms (Ebbell 1937: 70; Fuchs 1964). Whatever the cause of the blindness, if we are to accept the interpretation at face value, it would appear that these examples of the physically disadvantaged were not excluded from society; on the contrary, they were provided with active employment in elite social environments. The inclusion of statements of 'symbolic' blindness suggests that the condition was even desirable within this role, for ideological reasons.

7.2.2. *Dwarfism*

Dwarfs were depicted in more than fifty tombs fulfilling a variety of roles including; personal servant, jeweller, animal attendant and entertainer (Weeks 1984: 163-195; Dasen 1993: 109-110). Dwarfs were depicted as jewellers, shown in twelve of the examples (Dasen 1993: 120), especially in the Old Kingdom, probably as their small hands increased their manual dexterity when working on intricate objects (Weeks 1984: 184). Possibly, their reduced physical power, as a result of their deformity, made them better suited to less physical tasks.

The artistic representation of dwarfs was clearly differentiated from minor figures of normal stature in tomb reliefs, by their physical disproportion (Dasen 1993: 35). Not all jewellers were dwarfs, as confirmed by depictions of a combination of normal and disproportionate figures (Dasen 1993: 121), but it might be safe to assume that the depiction of dwarfs in association with specific occupations was an intentional device, used by the artist to convey a real situation. To infer the incidence of dwarfism, as a percentage of the population, from these artistic representations, would be misleading, as, in common with examples of occupation-related diseases, the artist was depicting his mental image of a general situation that clarified the role of the individual. The

tomb of Ankh-ma-hor includes an intriguing scene of jewellers at work (Kanawati and Hassan 1997: pl. 40; Figure 26. Appendix: 2), where two dwarf figures appear to be amputees. The artist may have been indicating that both dwarfs and those individuals with physical impairments were associated with the task, although this is an isolated example and interpretation remains uncertain.

Similar to the positive attitude possibly displayed in favour of the employment of the blind as musicians discussed above (7.2.1.), individuals demonstrating dwarfism appear to have been incorporated into a similarly practical role. The excavation of dwarf skeletal material from within a cemetery designated to administrative classes at Giza perhaps reinforces this notion of social integration. It is possible that dwarfism, amongst disabilities, occupied a privileged position due to their association with protective gods, although their occupations reflect their non-elite roles, with few examples figuring amongst the elite and literate (Dasen 1993: 156). The absence of any reference to dwarfism in the medical texts perhaps reflects the recognition within society that the condition was unchangeable, and integration was implemented on this basis. Although it is difficult to determine whether the social acceptance preceded or post-dated the association with godly characteristics, either option suggests a positive connotation.

To summarise, the artistic representations of non-elite individuals within an elite funerary context indicate a range of physical abnormalities. A number of these have been denoted intentional devices incorporated to clarify the role of the individual worker. Examples of *genu recurvatum* and schistosomiasis in particular follow occupational patterns and suggest that the conditions may well have been acquired as a result of the occupation. Additional examples of blindness and dwarfism indicate social inclusion and occupational roles fitting to the physical disability.

Chapter 8

Protective equipment in artistic representation

A direct correlation between individual occupation and non-elite health issues can be proposed in those scenes that include the representation of protective clothing or equipment in association with manufacturing processes. The problem resides with the identification of such evidence. The expectation would be that practical measures would be adopted to safeguard the worker from, for example, excessive heat. Precautions would indicate that the ancient Egyptians had identified the problems and sought methods of preventing them, demonstrating a simple cause and affect relationship with pragmatic answers. If these protective items were widely used it would be anticipated that their inclusion in the artistic representation would be necessitated as part of the tools of the trade, the incorporation of which was considered to be vital for the clarification of the role. Contrary to expectation, there are very few examples, identified to date, of the representation of any protective equipment. The following table summarises the artistic evidence. The depictions contribute to our knowledge of the type of hazards faced and the proactive measures taken to overcome them. The examples catalogued below are not exhaustive but provide examples of each occupation where protection was included.

Protection	Occupation	Tomb	Location	Date	Reference	Figure
Heat	Metal smelting	Rekh-mire	Thebes	18th Dynasty	Davies 1943: pl. 52	27
"	"	Mere-ruka	Saqqara	6th Dynasty	Duell 1938: pl. 30	28
Drowning	Boatman	Ti	Saqqara	5th Dynasty	Wild 1953: pl. 124	29
"	Herdsman	Akhet-hetep	Saqqara	5th Dynasty	Davies 1900-1901: II: pl. 8	30
Wrist bands for friction burns	Archers	Senbi	Meir	12th Dynasty	Blackman 1914: pl.7	-

8.1. Heat protection

One specific activity, in which protection could be considered to be vital, was during the performance of tasks that required the handling of molten metals at high temperatures. The ancient Egyptian artist, in agreement with the rules of convention, depicted metal smelting furnaces above the ground level. In reality, they were almost

certainly half buried within the sand (Scheel 1989: 16), but if represented in this way they would not be seen clearly. The sand around the partially concealed furnace would become very hot, but the workers, in accordance with most depictions of the human figure, were barefoot with no visible shielding from the heat. The hands were protected with the use of a stick cradle or stones to handle the crucible and decant the molten metal into moulds (Figures: 27; 28). This precaution was not always included in the representation (for example: Blackman and Apted 1953: pl. 17). This could indicate that the artist omitted the reference, or that the metal workers did, in reality, handle these intensely hot vessels, despite the melting point of copper being approximately 1000°c (Lucas 1962: 217). Hunter (1978: 770) describes the development of 'dense and horny' callosites on the palms and fingers of bakers and glass blowers, as a result of unprotected heat handling. Once established, the callosites enabled the operator to handle hot coals without injury. It is possible that the ancient Egyptian smelters developed a similar protective skin layer, a situation suggested by the 'Satire of the Trades':

'...But I have seen the smith at work
At the opening of his furnace;
With fingers like claws of a crocodile
He stinks more than fish roe.' (Lichtheim 1973: 186)

This description potentially lends support to the theory that hardening of the hands was a condition relating to metalworking. An isolated and ambiguous reference to burned hands and feet was included in the absentee list from Deir el-Medina (Janssen 1980: 136), which if correctly understood, perhaps indicated an occupation-related accident (Chapter 2: 2.4.). The artistic evidence suggests that either the metal workers handled crucibles unprotected, or the artist was not consistent with his depiction of protective equipment. It would be expected that if the artist associated certain accoutrements with a specific occupation that he would include them in the representation, to clarify the task being conveyed. The association of anatomical abnormalities with occupation, in representation, indicates that the artist did not use the deformity to define the task in all cases. Possibly we can assume that just as a proportion of herdsmen might have demonstrated, and were depicted with, *genu*

recurvatum, for example, only a quantity of metal workers were represented using the protective equipment available to them.

8.2. Protective clothing

The standard dress for labourers was the loincloth (Hall 1986: 25). Workers were generally depicted bare-footed and bare-headed, their costumes providing little protection against injury, or from the effects of working in the sun (Filer 1995: 14). Leather loincloths were worn by men involved in the following occupations; soldiers, sailors, craftsmen and servants, as a hard-wearing version of the more common linen garment (Vogelsang-Eastwood 1993: 17). It is difficult to ascribe a protective function to the leather loincloth, as the association with occupation was general. Whereas the sailor may require extra protection whilst rowing, other instances suggest the hard-wearing properties relate to the practicality of the garment, rather than to the protection of the wearer.

The absence of protective clothing is also attested by the fact that helmets were rarely worn in combat. The 'war crown' was introduced in the New Kingdom comprising leather and metal discs (Shaw 1991: 42). The human remains evidence indicates the use of wrist bands to protect archers from self-inflicted injury, where examples were identified in place on the deceased (Winlock 1945: 10), a detail only occasionally included in the artistic representations of archers. Fischer (1961: 74) suggests that scalloped edged aprons were worn as protection to the genital area, during combat, and were Nubian in origin. Penis sheaths were also, on occasion, depicted in association with battle (Vogelsang-Eastwood 1993: 51). Hicks (1983: 16) associates the penis sheath with an attempt to avoid bilharzia infestation, as the worm was thought to enter the body this way, although the textual evidence suggests that no such association were made in ancient Egypt. I suspect that this is a more recent observation (Chapter 7: 7.1.3).

8.3. Protection from drowning

Hieroglyphic signs V17  and V18  have been defined as papyrus life preservers worn around the necks of boatmen and functioning as floats (Fischer 1979: 48), although alternative explanations include that of a herdsman's shelter (Gardiner 1994:

523). Sailors were rarely depicted wearing life preservers and their representation in association with cattle herders further complicates their identity. It could be argued that both occupations required water crossing and so the life preserver was applicable in both instances (Figures: 29; 30).

To summarise, there is a dearth of evidence amongst the artistic representations to suggest that the workers protected themselves from the negative aspects of their occupations. If protective clothing or equipment were a regular feature of occupations in ancient Egypt, would the artists include them in their representations? It might be considered that, in accordance with the depiction of other tools of the trade, if the clothing or equipment were synonymous with the occupation being represented, they would be included to clarify the role of the individual. If this is the case then the evidence, from the artistic representations, suggests that few physical precautions were taken to protect the workforce. Alternatively, ideological explanations may be appropriate: in a funerary context that promotes the sense of order and success of the individual and the broader society, their omission may have been an intentional device. Similar to the portrayal of difficult or manually intensive occupations in a systematic and ordered manner, the introduction of the accoutrements associated with hazardous conditions may have been perceived as inappropriate.

Chapter 9

Occupational tasks in artistic representation

Tomb scenes and models from an elite funerary context provide a comprehensive source for the study of non-elite occupations in progress. The 'scenes of daily life' were included as a significant factor in funerary art, and were apparent throughout the Dynastic period. They highlight the technological and procedural aspects of occupations that influenced the working environment of the individual. Analysis of the technology involved has facilitated the successful reconstruction of implements and processes within the field of experimental archaeology (For example: Stocks 1986a; 1986b).

The funerary context for these depictions introduced a range of cultural and ideological influences, which in addition to the dictates of artistic convention, determined the inclusion or exclusion of specific activities and the character of their portrayal. The individual representations cannot be interpreted at face value due to these distorting biases. The distinction between the presentational aspects of iconography and factual information is seldom clear. A classic example of this disparity is illustrated by the transportation of a colossal statue depicted in a scene in the tomb of Djehutihotep at Deir el-Bersha (Newberry 1894b: pl. 15). The scene is potentially informative about the nature of the technology involved in terms of, for example, the wooden sledge, or the system of pulling ropes, but any analysis based upon the quantity of labourers depicted should be cautious. The numbers shown are more likely to be fulfilling the dictates of iconographic presentation, as opposed to providing us with an indicator of the actual manpower requirements. The chant recorded in the associated hieroglyphic inscription demonstrates the formalised presentation and use of traditional, institutionalised wording. As Parkinson (1991: 27) points out, the light-hearted content was extraordinarily unlikely, given the exertion required by this labour intensive activity.

The subject matter for tomb scene depictions of occupations and the workers associated with them were restricted to either the role of the deceased during life, or to tasks relating to the provision for the Afterlife (Eyre 1987a: 27). The record is

incomplete with the exclusion of numerous occupations including those of, for example, quarrying and construction, where the inclusion or omission of abnormalities amongst the workforce due to injury would be most informative. The stage by stage format adopted by production scenes demonstrate the importance of the process involved in the recreation of materials as opposed to the finished objects, which would be finite and insufficient as a supply for eternity. This concept perhaps explains why the selection of occupations focused on domestic industry and food production, but omitted whole categories of tasks including mining, quarrying, pyramid building and mummification. The role of the shabtis in providing manpower for corvée duties in the Afterlife may have negated the necessity for the depiction of manual activities. Shabti inscriptions guaranteed the provision of labour for agricultural and irrigation activities in addition to unqualified but 'unpleasant tasks' (Stewart 1995: 49).

The extraction of literal information from the scenes depicting aspects of daily life, and thus occupations in progress, should be cautious as they were standardised and largely idealised to reflect the concept of a desirable Afterlife. Avoiding the transitory nature of a specific event or object as opposing the concept of eternity as a prerequisite for an enduring Afterlife (Weeks 1979: 68), resulted in representations of a general and holistic view of a particular activity that embodied the most characteristic aspects. '...the all-encompassing picture identifies an order of *secure and significant* value in what is otherwise the banal chaos of immediate experience....' (Davis 1989: 206). Specific references, when included, were confined to the associated texts and titles (Weeks 1979: 61). This is an important consideration when interpreting the representation of the human figure, as the 'typical' appearance of individuals involved in tasks was significant. Occupations were depicted habitually with precision, showing individual processes in various stages along the registers and it would be incorrect to assume that the representations conveyed a generalised impression at the expense of attention to detail. Inscriptions, accompanying the specific representations, although frequently standardised, include titles and descriptions thought to indicate the relative social position and patronage of the worker (Valbelle 1990: 32; Drenkhahn 1995: 331-2).

A selection of scenes are catalogued in table 5 (Appendix: 1) and comprise either sole examples, or represent a genre of 'scenes of daily life'. No attempt has been made to include all the scenes of 'domestic' occupation, as the data would be repetitive. These occupational scenes contribute both to our understanding of the nature of work in ancient Egypt, and to the choice of tasks suitable for depiction within a funerary context.

Additional sources for the appreciation of occupational procedures bearing a close correlation to the tomb scenes of comparable tasks are the funerary models. The practice of placing models in the tomb originated in the Old Kingdom and was most prevalent during the 11th Dynasty (Lansing 1955: v). In common with the tomb scenes, the tomb models portray an elite perspective on the activities of the non-elite and should not be interpreted as a direct representation of reality, although in many cases a close correlation between the archaeological evidence for occupational installations has been noted. It is significant to appreciate that the purpose of these models was the portrayal of occupational procedure and perpetual activity for the Afterlife, as opposed to any attempt to represent specific individual workers (Bourriau 1988: 93). Errors in interpretation do occur when both the scenes and the tomb models are construed literally, as neither genre respected the realistic proportions of the human figure. This negates any attempts to arrive at conclusions about the utilisation of space or manpower requirements (for example: Winlock 1955: 76), or relative sizes of, for example, the associated livestock (Gilbert 1988: 71). Together with the tomb scenes, the models provide valuable information about the technological process of specific occupations and even the habitual posture of the participants. Interpretation should proceed no further if errors imposed by the ideological dictates of funerary contexts are to be avoided.

Table 5 (Appendix: 1) lists the occupations for which we have artistic representational evidence in the form of tomb scenes and/or models. The potential detrimental affects to the health of the workforces involved are highlighted based on a combination of the information the scenes provide about the physical occupation and associated environment, together with supporting textual and archaeological evidence. The table demonstrates in summary form the range of injuries and diseases that the non-elite workforces were at risk from as a result of their occupational activity. Of course this

is implied evidence and depictions of the workers themselves only rarely display symptoms of their possible conditions (Chapter 7), but comparative information from pre-industrial and industrial societies (Hunter 1978) form a concrete basis for these hypotheses. Many of the debilitating conditions are internal, for example silicosis and squatting facets, and would not be recognisable from any artistic representation of the human form. These require supporting evidence from the human remains evidence to confirm their existence (Chapter 12).

9.1. Direct health implications

The direct health implications of occupations include the cuts, burns, sprains and fractures that would be immediately noticeable and resultant from recognisable sources. The Edwin Smith papyrus catalogues a range of examples that represent this category of trauma (Table: 1. Appendix: 1). The occupational and environmental details included in the artistic representations of tasks in progress suggest that those involved in, for example, metal smelting, faience production and baking would have been most at risk from burns due to their proximity to kilns, and their handling of crucibles and moulds. Miners, carpenters and gardeners would be more likely to experience cuts, penetrating injuries and fractures. Whilst the record of occupations through the artistic media is incomplete, it does provide an indication of the range of injuries likely to have been experienced.

9.2. Indirect health implications

The indirect health implications of occupations include the conditions and diseases that gradually affect the individual as a result of, for example, habitual postures, repetitive movements, inhalation of dust and exposure to parasites and infectious diseases. The tomb scenes and models indicate that a number of occupations, including basket making and weaving required the individual to adopt a squatting position. Prolonged practice gives rise to 'squatting facets' where skeletal changes accommodate the unnatural position and an increased prevalence amongst workers of specific trades would be expected. The human remains evidence appears to support the supposition that the condition was prevalent (Satinoff 1973a: 210-212), but it is not possible to identify the occupation of the individuals studied nor to appreciate the impact of squatting as a 'domestic' activity, in addition to an occupational one. Stone drilling, weaving and playing musical instruments would contribute to repetitive

strain injuries and muscular disabilities. Mining, sculpting, stone drilling, cereal production, brewing and baking would expose the individual workers to the inhalation of particles, predisposing them to silicosis, asthma and tuberculosis. Fishermen, papyrus gatherers, cattle herders and gardeners would be susceptible to infestation with schistosomiasis due to their contact with water from the Nile and irrigation channels. The artistic representations of individuals involved in water-based occupations occasionally include symptoms of schistosomiasis in their depiction (Chapter 7: 7.1.3.). Potters and mud brick manufacturers would be prone to ankylostomiasis, a parasite inhabiting the mud they modelled into pots, and miners, in common with other workers occupying confined spaces would be at risk from infectious diseases, including tuberculosis, due to lack of ventilation.

To return briefly to the transportation scene in the tomb of Djehutihotep, the depiction suggests that the labourers would be prone to a combination of direct and indirect health affects. Crushing injuries, strains and rope burns would constitute immediate hazards, with dehydration causing both short and longer-term complications (Chapter 11).

To summarise, the tomb scenes and models of occupations in progress provide a detailed source for the observation of both occupational and environmental issues likely to impact upon health. They are informative concerning procedures, technology and technique and form the basis for hypotheses about the health implications associated with their practice. Caution must be exercised in assessing the quantity of individuals involved in specific tasks, as the division of labour indicated in the 'scenes of daily life' was likely to constitute a devise for clarifying the various stages of the process, as opposed to an accurate reflection of working practice. The insidious onset of many of the diseases and conditions characteristic of the indirect health implications would complicate any recognition that the task constituted a causative factor. The recognition of this link was to take a number of millennia to emerge (Chapter 1: 1.3.).

Chapter 10

Archaeological evidence and public health issues

10.1. Urbanisation in ancient Egypt and the interpretation of settlement archaeology

Settlement archaeology in ancient Egypt has identified the physical evidence for two broad and basic categories of social organisation. The first is characterised by its focus and development centring upon the demands of an agriculturally based community, where an adjacent position to the Nile was crucial and kinship ties formed the basis for cohesion. The second category includes the purpose-built settlements associated with royal burial sites that were designed to provision and house the construction team and subsequently those involved in perpetuating the cult of the dead king. These settlements demonstrate an alternative social dynamic where a common cause united a combination of professional administrators and conscripted labourers for set periods of time. The continual occupation often demonstrated by the first category of settlement was not a factor with the second, where the limited period of use, together with the preferred desert-based location, has contributed to the survival and accessibility of evidence relating to these more contrived arrangements.

The extent to which ancient Egypt was urbanised has been the subject of much debate and conflict of ideas, due to the paucity of evidence for settlement remains (as discussed by for example: Wilson 1960; Bietak 1979; O'Connor 1997: 15-16). The study of settlement archaeology has been further hampered by the lack of information regarding the actual process of urbanisation (Butzer 1976; Bietak 1979: 105-106; Hassan 1993). There is little doubt, in my mind, that the combination of the poor survival of the settlement remains and the elite focus predominant within Egyptology, as opposed to an actual lack of urbanisation, have been entirely responsible for the under-representation of domestic architecture in the ancient record. The archaeological evidence that has been identified indicates the presence of complex centres from the Old Kingdom onwards, and the textual sources confirm the existence of urban settlements throughout the Dynastic period (Adams 1997).

The archaeological evidence from settlement sites provides an opportunity to reconstruct the living conditions experienced by the resident community. By

excavating and interpreting the domestic settings attributed to the non-elite, an insight can be gained into aspects of non-elite existence frequently obscured from alternative sources of evidence. To gain an understanding of the possible health issues resulting from domestic circumstances it is necessary to relate contemporary information regarding public health issues to historically remote and fragmentary data. This construction of theoretical models based upon a combination of archaeological, historical and comparative information is a valuable asset in the greater appreciation of aspects of ancient societies, but in common with all methods of interpretation requires caution in its employment. Inherent problems exist in interpreting the ancient material and in the application of culturally specific information from a differing time period and social environment. The construction of past systems for the analysis of settlement design and development is no exception to this interpretative complication (Barrett 1994: 88-90), where subjectivity and incomplete information distort the picture. Various outcomes for the interpretation should be posed and it would be incorrect to apply a definitive explanation for the data (Wenke 1997: 118). A major disadvantage for theoretical models comprises the inability to test such hypotheses as might be proposed by the evidence: '... no absolute grounding exists for us to assess our own readings of the material against some spurious original and transcendental meaning.' (Barrett 1994: 89). Even in a situation where the evidence is comprehensive, in terms of comparative textual, artistic and archaeological sources, as in ancient Egypt, the opportunity for cultural interpretative errors are ever present. These important limitations to our understanding of ancient issues should be outlined before attempts at creating hypothetical models are commenced.

There is no doubt that the hypothetical or theoretical models based upon the observation of social organisation, in terms of the structural representation of domestic arrangement and facilities, manifest in settlement archaeology, can highlight medical implications for the inhabitants (Fábrega 1997: 3). The utilisation of cross-cultural comparisons in terms of social characteristics is invariably hazardous, where both similarities and differences arise from alternative sources (Wenke 1997: 118). The inevitable comparison between patterns of disease and human response within different cultures and time periods, vital for the meaningful interpretation of the ancient data, must be mindful of the variable criteria including standard of nutrition,

immunity and varying susceptibility to disease. All these contributing factors to the manifestation of disease within a community are capable of influencing morbidity and mortality patterns and distorting our preconceived expectations (Scheidel 2001: 113-114).

A traditional attitude towards data collection and artefact recovery has impeded the theoretical study and interpretation of settlements in ancient Egypt. The processing and documentation of the substantial volume of elite architectural, mortuary, artistic and textual evidence has taken precedence over both non-elite studies and a critical theoretical approach to the data (Lehner 2000c: 281). Detrimental formation processes, and professional preoccupations with philology and elite achievements have conspired in the under-representation of settlements within the archaeological record, even at the most fundamental data collection level. Egyptology has been slow, in comparison with other disciplines, in its utilisation of theoretical approaches. But more recent studies have attempted to redress the balance by focusing upon the environmental, socio-economic and cultural aspects of settlement patterns (for example: O'Connor 1972; Smith 1972; Butzer 1976; Bietak 1979; Shaw 1992; Adams 1997; Lehner 2000c; Meskell 2002).

A number of sites have been excavated and documented in varying degrees of detail, but remain non-representative of settlements in general, both in quantity and function. The accident of survival has favoured the more 'unusual' sites, situated away from the Nile flood-plain for ideological reasons, often in association with elite burial locations. These 'state-planned' settlement sites were created, occupied and abandoned within a relatively short time span, greatly facilitating their interpretation without the complication of subsequent phasing and reuse patterning. Their dispersal in time throughout the Dynastic period and specific purpose does not convey the consistency in occupation and adaptation that would be expected in the more 'organic' examples of settlement architecture. There is no doubt that they played a significant role in the social and political organisation of their time, but they cannot be considered to be typical. The surviving architecture reflects a uniformity consistent with the creation of a functional centre, a pattern considered as evidential proof for state intervention in design, where the ground plan represents the physical manifestation of that state-organisation in its provision for a complex society (Kemp

1989: 138; Lehner 2000c: 284). Aspects of control are indubitably identifiable through the evidence for urban design within the archaeological record (Trigger 1974-1975), where social order in terms of spatial organisation, constitutes a factor characteristic of that control (Kus 1982: 53-55), although not always straightforward to interpret (Badawy 1967; Uphill 1972; Lehner 2000c). At Giza, the regular patterning of the gallery system suggests a settlement designed for ease of control over the movement and activity of both people and resources (Lehner 2001b: 2). It is important to observe that where, for example, mortuary, trade or ideological factors influenced the establishment or re-siting of settlements on previously unsettled territory, state-planning, in terms of strict control, must not be confused with the architectural organisation that would accompany any new venture. It would be expected that pre-planning in terms of layout and raw materials would be apparent. Kemp (1989: 138) comments that an 'intuitive sense of harmony and proportion' should not be mistaken for a complex degree of pre-planning. With single phase planning of substantial settlements, the 'organic' element to their development is only introduced over time as at, for example, Deir el-Medina (Bruyère 1924-1953). Where intentional abandonment occurred, as with sites like Giza (Lehner 1999b: 3-4), this adaptive stage may not have been attained.

10.2. The archaeology of settlements and public health issues

To attempt an understanding of public health issues, an appreciation of the wider environmental and cultural dynamics that shape the society is required (Goubert 1987: 42). The environmental concerns can be tentatively traced through the settlement remains and the cultural questions centred upon knowledge of aetiology, attitudes towards disease and contagion control (Goubert 1987: 43-4). The monumental construction activities that were characteristic throughout the Dynastic period, required the personal or indirect co-operation of a substantial proportion of the population (Arnold 1991: 4). To fulfil this requirement, the non-elite were subject to a labour system that we have denoted 'corvée', the participants of which could be relocated for the duration of their commitment. The archaeological evidence suggests that a state-planned system of urbanisation was devised to accommodate and provision the workers, particularly in association with royal funerary projects. Consequently, substantial numbers of individuals were removed from their agricultural pursuits in rural environments, and placed in an urban setting. The

implications associated with the process of urbanisation, in terms of demographic, social and cultural adaptations (Hassan 1981: 235), are particularly apposite in facilitating an understanding of non-elite health issues. The settlement data utilised within this chapter pertains to a cross-section of a wide variety of sites from both the 'state-planned' and 'organic' categories. However, it is the former that will provide the most information about the health implications associated with the relocation of workforce, where the hazards involved with population movements and fluctuations would be most apparent. The 'organic' sites provide an insight into the living and working arrangements adapted to house and facilitate domestic and craft activities.

Urbanisation constitutes a complex process of social and cultural adaptation that impacts upon the wellbeing of the individual in many ways (Waldron 1989: 55). The archaeological evidence for settlements, specifically related to occupational activity, provides an insight into the conditions experienced by the non-elite, details predominantly absent from the alternative sources of evidence. The relationship between urbanisation and health is complex. It would be expected that the health benefits of a rural existence, as opposed to life in an urban settlement, would be marked and consistent. Whereas this is generally the case, additional factors including living conditions, population diversity and transience, diet, occupation and medical intervention have to be taken into consideration (Waldron 1989: 55). The subject has been widely researched, specifically with reference to the detrimental effects of the 19th Century urbanisation of Europe (for example: Woods and Woodward 1984; Kearns, Lee and Rogers 1989; Nelson and Rogers 1989; Landers 1993; Vögele 1998). The phenomenon denoted the 'urban penalty' defines the increase in morbidity and mortality associated with the environmental change from rural settings to small conurbations, in addition to large industrial settlements (Kearns 1989: 7).

Urbanisation affects health either positively or negatively, by altering the pattern of infectious diseases and the habitat of parasites, and by affecting the individual and community resistance towards disease. To appreciate the implications of urbanisation in an ancient context, theoretical models are presented below, created with the use of the combination of archaeological data and our knowledge of public health. Consequent interpretations are hampered by deficiencies within the archaeological

record and their understanding, and in the assumptions required when imposing modern data onto an ancient context. Hypothesis is all that can be achieved, which, although constituting an important aspect of theoretical interpretation, remains non-testable and therefore unsubstantiated.

10.3. Settlement archaeology data sets

A number of settlement sites have been selected for the purposes of demonstrating the living conditions experienced by non-elite workforces and the associated health implications that these domestic arrangements would have incurred. It would not be possible nor appropriate within the confines of this thesis to discuss all the sites with evidence for non-elite habitation. The sample of settlements selected for this chapter are not intended to be representative of urbanisation as an entity, but they have been included for their information about non-elite living conditions either in specific occupation-related environments, or within the non-elite sectors of urban developments. A number of settlements including Giza, Amarna, Gurob and Deir el-Medina provide the architectural and archaeological evidence for non-elite living conditions at the household level, where activity areas and boundaries can be established (Meskell 2002: 121-125). Domestic industry would have been located within settlement settings, as demonstrated at for example Kom Rabiᶜa, but most informative about the overall impact of tasks upon health are the occupation-related settlements constructed for short or long-term usage whilst individuals were employed on state projects. Throughout history the process of relocation into an urban setting has been the catalyst for numerous health implications, and the archaeological evidence from ancient Egypt facilitates an evaluation of the potential impact on an ancient society. Additional evidence is utilised from the 'workmen's' villages' at Amarna and Gurob, which together with the settlements of Kom Rabiᶜa and Elephantine provide comparative information about non-elite conditions within both planned and established settlements. Deir el-Medina is also included as it provides a comprehensive insight into a New Kingdom settlement created specifically to house workers. Although considered by some to be unusual in its occupational exclusivity, focused on the construction and decoration of the royal tombs, it remains informative about the lives of individual workers in terms of the living conditions and the associated health implications of an urbanised environment. Recent research is questioning the accuracy of labelling Deir el-Medina as non-representative of a

broader picture of social existence (Meskell 2002: 38), and it would be certainly a mistake to omit it from any research that considers workforces and their environment. Gebel el-Asr and Hatnub are included as examples of temporary arrangements provided for workers whilst occupied in expedition-related or remote locations. Examples of Nubian forts have been included for comparative information. Thebes has not been included within the sample of settlement sites as, despite its significance as a religious centre, inaccessibility of the ancient settlement due to sedimentation and redevelopment has inhibited excavation (Bietak 1979: 125). The insufficient publication of the data relating to the site has resulted in a dearth of information pertaining to living conditions (Meskell 2002: 33).

The following table summarises the data utilised within this chapter:

Site name	**Date**	**Location**	**Type of settlement**
Giza	4th Dynasty (2589-2503 BC)	West bank of Nile, Giza plateau, at foot of *Mokattam* escarpment	Settlement constructed to provision and accommodate members of the 'permanent' workers associated with the building of the 4th Dynasty pyramids
Lahun	12th Dynasty, specifically Senwosret II (1880-1874 BC)	Eastern edge of Fayum	Settlement site constructed to accommodate the officials and workers involved in the construction of the 12th Dynasty pyramid and subsequently those employed to perpetuate the cult of the dead king
Elephan-tine	Middle-New Kingdoms	First cataract, Upper Egypt	Southern border walled settlement site with authority over granite quarries
Amarna work-men's village	18th Dynasty, specifically Akhenaten (1352-1336 BC)	El-Minya, East bank, Middle Egypt, 280km south of Cairo	Walled settlement situated to the east of the main settlement, built to house the workers of the community during the new capital's existence. Demonstrates single-phase habitation of twenty years duration.
Kom Rabi'a	18th Dynasty-Third Intermediate Period	South of Mit Rahina, Memphis, West bank, Upper Egypt	Small domestic settlement of which New Kingdom levels have been sampled, demonstrating non-elite housing with craft activities and substantial diversity in material culture deduced from archaeological and artefactual record
Dakhla	Old Kingdom	Libyan desert, 300kms west of Luxor	Oasis settlement
Gurob	18th-20th Dynasty	South eastern end of Fayum	Walled settlement site with evidence for subsequent 'organic' development and association with the royal harim and textile, glass, stone and metal industries
Deir el-Medina	18th-20th Dynasty	West bank, opposite Thebes	Walled, planned settlement constructed to accommodate tomb builders and decorators and their families

Site name	Date	Location	Type of settlement
Gebel el-Asr	Old -Middle Kingdom	West of lake Nasser and south of Wadi Toshka	Diorite quarries with evidence for stone shelters
Hatnub	Old Kingdom to Roman period (2589 BC-AD 395)	Eastern desert. 65km south east of el-Minya	Travertine quarries and seasonally occupied workers' settlement
Buhen	12th Dynasty	North of second cataract, Upper Nubia	'Plains type' frontier fortress, providing habitation for military
Semna	12th Dynasty	Second cataract, Upper Nubia	Second cataract fort

10.3.1. *Giza*

The Old Kingdom settlement at Giza constitutes a prime example of a state-planned settlement. As the excavation results are awaiting publication the following brief description is based on personal observation and communication with Professor Mark Lehner, the Director of excavations. The site comprises a substantial settlement located to the south east of the 4th Dynasty pyramids. Excavation and survey, to date, has identified an area of occupation approximating 45,000 square metres, although intensive excavation has concentrated on an area of 5000 square metres. The final extent of the settlement has yet to be established due to the continued occupation of the eastern section in the form of the modern Cairo suburb of *Nazlet es-Semman* (Lehner 2001b: 1). The settlement is positioned at the foot of the west bank *Mokattam* formation escarpment constituting the Giza plateau, and is separated from the royal complex by an Old Kingdom wall and gateway to the north (Figure: 31. Appendix: 2). The site dates to the 4th Dynasty of the Old Kingdom (2613-2494 BC), with a potential occupation period of 70 years, from the reign of Khufu to that of Menkaure (2589-2503 BC) (Lehner 1999b: 11). The dating of the site has been achieved by the examination of the pottery and sealing material (Lehner 1999b: 8). The archaeological evidence suggests two distinct phases of occupation, with a substantial building and expansion programme superseding an existing site (Lehner 1999b: 11). Remodelling was potentially necessitated subsequent to the damage caused by rainwater and flooding (Butzer 2001: 5). It would also appear that the settlement was intentionally abandoned at the end of the 4th Dynasty (Lehner 1999b:

2-3), possibly as a result of its vulnerability to flooding, but also due to the relocation of the royal burial site further south to Saqqara and Abusir.

The ordered layout of the settlement has been mapped and documented, and a predominance of gallery systems constructed out of mud brick and limestone has been revealed (Lehner 2000b: 2-3). This grid of structures, serviced and connected by streets, would support the theory of a single-phase, state-planned, function-orientated settlement. The site at Lahun, associated with the building, and subsequent cult maintenance of the Middle Kingdom pyramid of Senwosret II (1880-1874 BC), indicates a comparable grid formation (Kemp 1989: 150) (below: 10.3.2.). Excavations at Giza have exposed the complexity of the site and the range of functions accommodated. To date, the evidence includes a hypostyle hall, bakeries, possible fish- and meat-processing areas, copper workshops, a gatehouse, magazines, houses and a paved street (Lehner 1998: 11; 2000b: 2-7) (Figure: 32. Appendix: 2). Professor Mark Lehner has been excavating the site since 1988, excavation proceeds on a seasonal basis and information continues to emerge.

My involvement with the excavation and illustration of artefactual evidence at Giza from 2000-2003 has enabled me to examine the emerging evidence first hand and to apply my specific research questions to the information. However comprehensive published reports might be, they are unable to address the subject in as much detail, unless they are written from the same perspective. As discussed above (Chapter 1: 1.1.), studies that examine the social implications of archaeological findings are rare, and so the opportunity to benefit from previous research is limited. Subsequent sections of this chapter (10.4.; 10.5.) utilise the information from Giza to form the basis for the proposed theoretical model on public health issues amongst non-elite workforces, as it contributes fresh information to the body of published data concerning other settlement sites. Comparative data, where available, has been included to highlight discrepancies or to substantiate details.

10.3.2. *Lahun*

The Middle Kingdom site of Lahun is situated on the eastern edge of the Fayum region, in the Libyan desert in Lower Egypt, south-west of Cairo. The settlement was designed and built during the reign of Senwosret II (1880-1874 BC) and was

positioned to the east of the valley temple. The primary function of the town was to accommodate the workers associated with the construction of the pyramid and the subsequent perpetuation of the cult of the dead King. The site was divided into two: the pyramid complex itself; "Power-of-Senwosret-true-of-voice" and the town; "Peace-of-Senwosret-true-of-voice" (Parkinson 1991: 88). The existence of a town site in association with a pyramid complex illustrates the continuing significance of the funerary cult from the Old to the Middle Kingdom, as a functional and economical base for a community. The advantageous position of Lahun, on the cultivated section linking the Fayum with the Nile valley, is thought to have extended its success as a settlement site beyond the normal life expectancy of a cult town.

The settlement of Lahun was constructed on a regular plan (Figure 33. Appendix: 2) and measured approximately 384 by 335 metres (Kemp 1989: 151). Analysis of the grain storage facilities suggests a population of 5000 individuals could be maintained (Kemp 1989: 153). The settlement represents a substantial site when compared to other Middle Kingdom sites, for example Abu Ghalib and Tell el-Daba, and archaeological evidence suggests a single construction phase. As at Giza, the planning required to produce uniformity in town design implies a central controlling power sufficiently autonomous to be able to dictate ground plans at a local level. The living arrangements demonstrate segregation between the small quantity of large houses for the elite and a substantial number of small houses serving as accommodation for the workers. A section of the workers' accommodation was located within its own perimeter wall effectively alienating it from the rest of the town. The small units outnumber the large houses on a ratio of 20:1, although excavation is incomplete (Kemp 1989: 155) and future surveys may result in an adjustment of these figures. The workers' houses demonstrate variability in their interior arrangements and a number accommodate small granaries presumably to supplement the supplies from communal facilities (Kemp 1989: 155).

Archaeological evidence suggests that Lahun possessed a street drainage system similar in arrangement to the medieval kennel. This would allow pedestrians to negotiate the streets avoiding the muddy channel in the centre. Petrie (1891: 8) suggests that as the system was present in the workers' streets the feature must have been standard during the Middle Kingdom. A 'guard house' to the south of the

settlement was utilised as a town dump subsequent to its abandonment. Evidence for rodent infestation has been suggested from the rubbish filled holes in domestic units (Petrie 1890).

The town archive covers a range of subjects including legal documents, a house census, scientific and religious works, literary documents and letters. Administrative documents include information about the organisation of corvée workforces (Chapter 2), bureaucratic processes that must have been familiar to the inhabitants of Lahun during the construction period of the pyramid. The presence of a medical treatise within the settlement site is perhaps indicative of the site of use. Of course it cannot be known to what extent the non-elite were involved as recipients of the treatments, but the gynaecological content indicates a society intent upon addressing the issues of fertility and the hazards of childbirth.

10.3.3. *Elephantine*

The site of a settlement from the Naqada II to the medieval period, it is the Middle and New Kingdom remains of the domestic areas at Elephantine that have provided the focus for recent research (Von Pilgrim 1997). Excavations have revealed domestic units indicating structural alteration over an extended habitation period, and a Middle Kingdom centre for the storage and distribution of food (Von Pilgrim 1997: 16). The settlement areas comprise blocks of house units demonstrating 'tripartite' and 'court-centred' designs. Rooms demonstrate flexibility of function and the evidence for areas designated to specific activities remain confined to baking pursuits, and animal accommodation (Von Pilgrim 1997: 17).

10.3.4. *Amarna*

Located in Middle Egypt on the east bank, Amarna was established on a desert site during the New Kingdom where the unlimited availability of land for building resulted in an expansive layout covering 4-5 kilometres in length and 800 metres in width (Bietak 1979: 121). Unusual in the absence of a perimeter wall, the settlement at Amarna demonstrates the more familiar aspects of town planning in terms of differentiated areas for social divisions and activities in addition to a regular street and house patterns (Shaw 1992: 150). The combination of houses of varying sizes throughout the South suburb perhaps denoted the inter-dependency of the social

groups, in terms of an exchange mechanism between the provision of labour in return for food (Meskell 2002: 31). The analysis of house sizes at Amarna has prompted discussion as to the relationship between capacity and social strata, where, despite the complications in interpreting the data, it is apparent that 65% of the population inhabited houses of under 100 square metres (Shaw 1992: 156). The smaller houses were concentrated in the North suburb, housing individuals with a variety of occupations, with labourers alongside those with scribal positions (Meskell 2002: 31). Artefactual evidence from these domestic units indicates the range of crafts carried out as domestic activities. The evidence for ovens in the small house units suggests that external supplies of raw materials were processed into bread at the responsibility of the individual households (Samuel 1999: 121; 134). Pigs constituted an important source of protein domestically (Ikram 1995: 211; Samuel 1999: 128), in addition to game, fish and birds (Meskell 2002: 42). The proportion of cattle bone retrieved from the site has been considered low, a factor possibly due to the survival of the evidence and disturbance activities (Kemp 1995b: 163).

A distinct 'workmen's' village has been identified to the north of the main settlement area (Figure 34. Appendix: 2). Comparisons have been made with Deir el-Medina, as both sites represent the tangible evidence for a state-planned domestic area designed specifically for the habitation of workers (Meskell 2002: 33). Differences should not be overlooked and the identification of, for example, animal pens and water storage facilities identified at Amarna are absent from Deir el-Medina (Kemp 1987: 43). The workmen's village at Amarna comprises a square walled enclosure, subdivided into approximately 70 predominantly uniform house units. A larger overseer's house and animal pens comprise the only variants in architectural design. Entry was directionally controlled via a gate in the south, providing access into an open area utilised to house both animals and their waste (Meskell 2002: 41). Although the site has been subject to limited disturbance (Kemp 1995b: 158), affecting the provenance of artefacts, the standard of evidential survival, including organic material, is high (Kemp and Vogelsang-Eastwood 2001: 250). Evidence for food and textile production and storage is prevalent (Meskell 2002: 41). The architectural evidence suggests that subsequent to the state initiating the design for the houses, the individuals were responsible for modifications (Kemp and Vogelsang-Eastwood 2001: 252). Constructed from mud bricks, the house units were subdivided into four

areas. Artefactual evidence from the entrance room within the structures indicates the presence of animals and industrial occupations, including spinning, smelting and stone bowl manufacture (Meskell 2002: 44). The middle room was the site of domestic activities with hearths, divans and wall paintings, and the function of the back rooms remains unclear, but possibly housed the staircase, kitchen and storage area. A failure in the retrieval of definitive artefactual and textual evidence relating to the identity of the occupants of the workmen's village frustrates attempts at fully understanding the function of the settlement, where hypotheses range from tomb builders to desert police (Kemp 1987: 46).

10.3.5. *Kom Rabi'a*

Despite the significance of Memphis as a 'capital' centre, excavation of the site has been hampered by alluviation, an insidious process obscuring the archaeological evidence for the settlement. A small portion (500 square metres) of Memphis, denoted Kom Rabi'a, has been surveyed and documented with particular attention to the artefactual evidence for material culture (Giddy 1999b) (Figure 35. Appendix: 2). The site dates from the Middle Kingdom through to the Third Intermediate Period and, unlike the state-planned sites discussed above and below, the evidence suggests continuous occupation over this prolonged period (Giddy 1999b: 9). A sample of small houses with courtyards dating to the New Kingdom has been excavated, resulting in the retrieval of a substantial collection of provenanced objects. The mud brick architecture, comprising narrow walls and clay floors conforms to the typology for non-elite house plans of the period (Giddy 1999b: 3) derived from evidence from Amarna and Deir el-Medina. The finds relate to craft activities and domestic food production, in addition to ceramics, 'ritual' items and objects for personal adornment (Giddy 1999b: 10). The combination of household, domestic and ornamental items indicates a complexity in material culture in contrast with the evidence for the modest architectural remains (Giddy 1999b: 10).

10.3.6. *Dakhla*

Located in the Libyan desert 300 kilometres west of Luxor, the settlement at Dakhla dates from the Old Kingdom. Artefactual recovery indicates that occupation was focused in the eastern part of the oasis at Ayn Asil (Giddy 1987: 169). Other sites in the western and central oasis areas seem to have been of secondary importance due to

their relative sizes. Habitational areas are indicated by mud brick structures, kilns, and ceramic and tool debris. A flint knapping site has been identified in the central oasis and other even smaller areas of settlement noted by their artefact scatters. Old Kingdom cemeteries have been found in association with these sites but with the excavations as yet incomplete the size of the population during this period is unknown.

10.3.7. *Gurob*

The New Kingdom site of Gurob in the Fayum provides an example of a planned settlement, where subsequent independent evolution in the form of rebuilding and redevelopment has resulted in a random format (Kemp 1987: 125). The town site developed over the temple remains (Petrie 1890: 33) and comprised a walled town, divided into three sections, with evidence for industrial activity including glass, stone and metal working. Unfortunately excavation techniques and post-excavation confusion has hampered attempts to interpret the living conditions at the site (Meskell 2002: 37).

Isolated studies of the human remains from tomb 5 attributed to Paraᶜmessu, have revealed individuals with a range of abnormalities. Pathological conditions include thoracic fusion indicative of tuberculosis, a case of raised inter-cranial pressure resulting in the separation of the cranial sutures and a misaligned healed fracture of the left clavicle (Elliot Smith 1927: 24-25). Although interesting as individual cases, the sample is too small to warrant further comment in terms of the potential health patterns within the community.

10.3.8. *Deir el-Medina*

The New Kingdom site of Deir el-Medina has provided a disproportionate amount of evidence about the lives of the occupants, both in terms of the archaeological remains and the textual data, when compared to other settlement sites. The information from Lahun overshadows other Middle Kingdom settlements in the same way. This situation has arisen due to the desert location of both the settlements, a factor that has contributed to the survival of the evidence. Neither settlement can be entirely representative of urban life for their respective periods, and in fact both are unusual in terms of functionality. They are informative about living conditions at the individual

and community level, and without further evidence from comparative sites it is not possible to assess how representative they actually are. Recent excavations at Kom Rabiᶜa (Above: 10.3.5.) have revealed a surprising complexity in material culture for a non-elite site, and future excavations may confirm that our previous assessment of non-elite existence may have been considerably influenced by excavation and survival limitations.

Located on the desert edge on the west bank at Thebes, the settlement at Deir el-Medina fulfilled a specific function in housing the tomb workers and families whilst constructing and decorating the royal tombs. The occupational roles of the inhabitants were restricted to those required to fulfil this function and in this capacity do not provide a representative example of the range of activities carried out in a less focused community. Deir el-Medina comprises a walled settlement covering approximately 5600 square metres, demonstrating a number of constructional phases for the sixty-eight mud brick domestic dwellings (Meskell 2002: 40) (Figure 36. Appendix: 2). The restrictive dimensions of the interconnecting streets have prompted the hypothesis that adjoining roofs (Meskell 2002: 40) may have provided access between structures. If correct, then light and ventilation internally would have been substantially reduced. The individual structures indicate a process of redevelopment and extension throughout their occupation, an operation of modification also seen at Amarna (Meskell 2002: 40). The internal subdivisions of the individual houses varied in number and format, according to individual requirements, and evidence for domestic food preparation and storage has been identified (Meskell 2002: 41).

10.3.9. *Gebel el-Asr*

'Chephren's diorite quarry' is situated at the site of Gebel el-Asr in Nubia. The site covers an area in excess of 100 square kilometres and comprises a number of distinct gneiss quarries. Archaeological evidence indicates activity at the quarry during the Old and Middle Kingdoms (Shaw 2000: 28). A settlement comprising twenty dry stone shelters has been identified in the area denoted 'quartz ridge'. The excavation of four of the shelters in 1999 revealed twenty-two storage jars dating to the 12th Dynasty (Shaw 2000: 29). The containers have been compared to Middle Kingdom grain jars from Lisht and Tell el-Daba, and their location within the shelters suggests

a storage function for the constructions as opposed to one of habitation. It is possible that the shelters were dual purpose; providing domestic facilities during forays and secure storage for subsequent expeditions during the absence of the workers. Without further excavation their true purpose remains obscure.

10.3.10. *Hatnub*

Hatnub consists of the travertine quarries and seasonally occupied settlement located in the Eastern desert, 65 kilometres south east of el-Minya. Inscriptions, graffiti and artefacts indicate a period of use extending from the Old Kingdom to the Roman period. Textual evidence suggests that the Hatnub quarries were the focus for substantial expeditions, but the accessibility of the site perhaps also encouraged smaller groups of artisans to forage for raw materials (Kemp 1989: 246).

A number of settlement areas have been identified and excavated. Clusters of single roomed crescent-shaped shelters and multi-roomed constructions have been dated to both the Old and New Kingdom by their artefactual contents. Occupational areas identified by alabaster refuse were located adjacent to the shelters (Shaw 1987: 162). Old Kingdom structures line the ancient quarry road in the form of basic wind shelters (Shaw 1987: 165). In addition, a succinct New Kingdom settlement has been identified consisting of 25-30 predominantly single roomed crescent-shaped structures. Building materials comprise loosely packed limestone slabs and boulders suggesting temporary shelters when compared to the communal accommodation typical of the Old Kingdom (Shaw 1987: 164). Evidence for water storage in the form of *zir* emplacements has been identified. The presence of worked stone and tools in the vicinity of the settlement perhaps suggests the combined function of the structures in terms of activity and domestic areas. Analysis based upon the single occupancy of the small shelters has resulted in the potential accommodation of the site of up to 300 individuals (Shaw 1986: 200).

10.3.11. *Buhen*

The fort at Buhen was constructed during the 12th Dynasty to safeguard trading routes to Lower Nubia. The site comprised a settlement measuring 150 by 138 metres surrounded by a fortified mud brick enclosure wall (Kemp 1989: 168). The river frontage provided direct access to the Nile and a water channel was devised to ensure

the availability of water during a siege. The enclosed settlement demonstrates a grid formation with granaries, an administrative building and a predomination of small housing units. The columned halls identified as granaries are reminiscent of the 'hypostyle' hall at Giza (10. 3.1.), where faunal remains suggest communal eating or food storage. The western side of the outer enclosure was utilised as a cemetery (Kemp 1989: 171). Although it is likely that the fort was inhabited predominantly by the military, further evidence suggests that in common with the sites of Mirgissa and Aniba, Buhen accommodated artisans and craftsmen beyond its perimeter walls (Bietak 1979: 127-8).

10.3.12. *Semna*

Situated at the second cataract in Upper Nubia, the Middle Kingdom fort at Semna comprises an L-shaped settlement extending to 130 metres across, circumscribed by a wall and guarded by fortified gateways (Kemp 1989: 174). The interior of the fort is characterised by a grid formation comprising small housing units of two or three rooms interconnected by narrow streets paved in stone. Detailed analysis of the grain rations evident from the storage facilities at Semna, in common with other forts, has tentatively suggested a population figure of between 2000 and 3,448 individuals depending upon the size of the ration consumed (Kemp 1989: 177).

10.4. The pattern of infection as derived from settlement data

Although the cause of death in ancient societies is difficult to determine from the human remains evidence (Waldron 1989: 65), it is likely that in common with pre-antibiotic societies, infection was in part responsible for the low life expectancy observed from ancient Egyptian data. The accurate ageing of skeletal evidence is hampered by interpretative limitations (Waldron 1989: 65), and the most common age at death (as opposed to average) identified at circa 25 years (Masali and Chiarelli 1973: 164; Sandison 1973: 213) must be treated as an estimate. Fatalities would have resulted from both endemic diseases and epidemics (Manchester 1983: 35), and the pattern and prevalence of these diseases would have impacted upon the health of both urban and rural populations to a greater or lesser extent.

The pattern of infectious diseases, in an ancient context, cannot be traced from the human remains evidence alone, due to the inconsistencies of skeletal changes and

interpretative limitations (Waldron 1989: 61). This absence of evidence from the physical remains is aptly demonstrated by an examination of 10,000 Nubian skeletons that failed to identify any evidence for tuberculosis or syphilis (Elliot Smith and Wood Jones 1910). This does not necessarily imply an absence of disease or an increased resistance to those diseases, nor that interpretation techniques were deficient (Sandison 1973: 220). Infectious diseases are simply under-represented in cemetery populations. Whereas isolated instances can confirm the existence of a particular disease within the ancient population, the wider impact upon the community cannot be proven, only inferred from our knowledge of particular disease patterns. The medical textual sources provide tentative references to specific conditions, but in the light of the interpretative limitations attached to their positive identification, perhaps a more satisfactory approach to health issues is an appreciation of the environmental conditions that would have precipitated outbreaks and dictated individual susceptibility.

10.4.1. *Environmental and social factors determining the rate of disease transmission*

Diseases are transmitted by air, faecal contamination of water or food, vectors and physical contact. An increase in population density does certainly lead to a rise in the infection rate of those diseases transmitted through the air and by contact, and can also increase the risk of infection resulting from faecal contamination (Boyd 1972: 348; Shope 1999: 85-89).

Examples of infectious diseases and their means of transmission

(Adapted from Boyd 1972: 347; Jones and Moon 1987: 147-148)

Airborne (4.1.1.1.)	Tuberculosis Measles Whooping cough
Faecal contamination of food and/or water (4.1.1.2.)	Typhoid, dysentery and other diarrhoeal diseases Parasitic diseases including schistosomiasis and ankylostomiasis
Vectors (4.1.1.3.)	Malaria (mosquito) Filariasis (mosquito) Eye diseases including trachoma (flies)
Contact - human	Syphilis, scabies, smallpox, trachoma, leprosy
- animal (4.1.1.4.)	Bovine tuberculosis (cattle) Cryptococcosis (pigeon)

10.4.1.1. Airborne transmission

A substantial proportion of infectious diseases originated from a habitually close proximity between humans and animals. Subsequently, the increased population density that accompanied urbanisation prompted a change in the pattern of disease facilitating direct contamination between humans (Waldron 1989: 59-61). The efficacy of airborne infections relies upon physical intimacy and prolonged contact with the infected person (Boyd 1972: 347). These requirements are frequently fulfilled within urban settings and a direct correlation between crowded living and working conditions and the spread of airborne infectious diseases can be identified. As an example, the combination of overcrowding and poor diet were the predominant factors in the spread of tuberculosis in English towns during the period of urbanisation in the late 19th century (McKeown 1976; Kearns 1989). The process of urbanisation in ancient Egypt could have prompted the development of 'human' tuberculosis from the existing bovine form, facilitating a greater efficacy in rate of spread. Unfortunately, due to the interpretative restrictions, the human remains evidence cannot confirm this hypothesis. Urbanisation not only introduces 'new' diseases, it alters the pattern of existing ones and facilitates the ease of airborne transmission in both cases (Waldron 1989: 59).

Settlement archaeology and the airborne transmission of diseases

To assess the potential for overcrowding within a settlement, it would be useful to know the approximate population levels and site capacity. Unfortunately, settlement capacity cannot be accurately surmised from the archaeological remains of the settlement itself. Even with the additional information provided by census material inaccuracies abound. Population calculations have been proposed based upon the analysis of archaeobotanical material, mortuary evidence and ethnographic data (Hassan 1981: 63-93). Results can only be estimates (Fletcher 1981), as demonstrated by the quantification and interpretation of cattle bone deposits at Giza (Redding 2000), and grain supplies at Lahun (Kemp 1989: 153) and Semna (Kemp 1989: 177). Economic output as an indicator of population size provides another source of unsubstantiated hypotheses, as the precise relationship between demography and performance is unclear (Scheidel 2001: 184). Manpower requirements for pyramid construction have been utilised to such purposes (David 1986; Lehner 1997a), but take little account of variability in demand at different stages of construction.

With these limitations in mind, it remains possible to hypothesise that the local population surrounding the site at Giza would have been insufficient in quantity to fulfil the manpower requirement for the construction of the pyramids, so recruitment from a broader geographical area was necessary (Butzer 1976: 87). An estimate of the population for Old Kingdom Egypt (circa 2500 BC), based upon projections for the potential agricultural output, identified settlement sites and comparable evidence, was surmised to be in the region of 1.6 million (Butzer 1976: 82-83). This population was involved primarily in agricultural based activities (Butzer 1976; Tyldesley 2000: 36). Butzer (1976: 83) proposes a population density in the Nile valley of 130 people per square kilometre, which contrasts dramatically with the population density at Giza where a possible 20-25,000 people were accommodated and laboured within an area measuring potentially two square kilometres.

Just as the population of the overall settlement can only be estimated, determining the capacity of individual houses also raises problems. Even the identification of sleeping platforms cannot rule out the potential for additional occupants accommodated on, for example, the roof. The archaeological evidence can indicate differentiation between the relative sizes and complexity of house units, their proximity to one another and to industrial areas and their segregation in terms of 'workmen's houses' and the more elite accommodation provided for administrators. The evidence from Lahun and Amarna shows this disparity clearly (Petrie 1891; Kemp 1989: 149-157; Shaw 1992). The compact living arrangements demonstrated by the archaeological evidence at, for example Lahun, Amarna, Kom Rabiᶜa, Deir el-Medina and Semna, in addition to Giza, would facilitate the transmission of airborne infections between individuals. The interconnecting roofing system at Deir el-Medina would further reduce light and ventilation providing an increase in the favourable conditions required for efficient cross-contamination. Without a greater appreciation of the nature of rural accommodation, it is not possible to determine the relative domestic overcrowding between rural and urban non-elite contemporaries. It is likely, however, that the urban working environment was more densely populated and that the urban dweller encountered greater population diversity than his rural counterpart, both important factors in the spread of infectious diseases.

The archaeological evidence for a terraced, gallery system identified at Giza, in addition to the artefactual distribution, indicates a combination of industrial and domestic space within the same structure (Figure: 32; Lehner 2000b: 6). The allocation of space may have been more loosely defined, with occupational activities taking place in both the gallery and the open court where light and space were more favourable. Just as the occupants at Kom Rabiʿa combined their domestic space with activity areas (Giddy and Jeffreys 1993: 19; Giddy 1999b: 10), it would be plausible to assume that the individuals inhabiting specific galleries at Giza were similarly combining domesticity with the industrial pursuits identified from the archaeological data. The cramped and poorly ventilated conditions within the domestic and industrial areas of the galleries would certainly encourage the spread of diseases between the inhabitants.

As yet there is no evidence for the accommodation of the seasonal workforce directly involved in the transportation of the stone and the construction of the pyramids. The potential size (estimated in excess of 20,000 (Lehner 1997a: 224)) and seasonal nature of the workforce leads me to suspect that they were housed in temporary shelters or camps. If the workforce were as substantial as estimates propose, the provision of formal accommodation would be time consuming and labour intensive, but perhaps this failed to constitute an obstacle amongst pyramid builders. Kemp (1989: 135) suggests that a proportion of the workforce may have camped on the construction site close to the position of their occupation. The quarry marks from Middle Kingdom construction sites certainly suggest a division of labour that also dictated the locality of habitation (Arnold 1990: 19). Another possible location for a succinct temporary campsite would be the unexcavated southern area of the settlement, downwind of the industrial pollution. Lehner (1997a: 204-5) hypothesised that it may be located to the west of the settlement, behind the cemetery and separated from the permanent site by the Maadi formation. As yet the excavation restrictions have inhibited the corroboration of either suggestion. If a temporary camp was provided, then the seasonal workforce in their makeshift quarters may have led a healthier existence than their permanent counterparts within the settlement. Permanent housing encourages the spread of disease, not only by imposing cramped conditions and lack of ventilation, but also by encouraging flies and vermin (Cohen 1989: 39-40). Faunal evidence from Giza confirms the existence of rats within the settlement. On balance,

I consider it optimistic, with the anticipated scenario at Giza, to suggest that a site accommodating 20,000 workers would not attract vermin and flies, no matter how temporary the settlement was.

Comparative evidence for the temporary housing of workforces is limited. Archaeological evidence from the Hatnub quarries indicates that rough semi-circular shelters and complex multi-roomed buildings were constructed adjacent to the work areas, during the Old Kingdom (Shaw 1987: 162). Shaw (1986: 200) makes the generous suggestion that single occupancy of each shelter was likely, as the abundance of building material would facilitate provision for each worker. A more likely explanation would be that the structures were magazines, used for the storage of tools and equipment during and after the season's work, with human shelters taking a temporary form and leaving little or no evidence in the archaeological record. The evidence from the Gebel el-Asr quarries certainly suggests a storage capacity for the stone structures, as on excavation they were found to contain a number of storage jars (Shaw 2000: 29). The absence of evidence for stone structures at, for example, Manzal el-Seyl has led to the conclusion that temporary structures for human habitation provide the only solution to the accommodation problem (Harrell *et al* 2000: 41). This situation is mirrored later at the Roman quarries of Wadi Umm Wikala and Wadi Semna, where supplementary 'tents' have been proposed to augment the simple huts identified as shelters (Sidebottom *et al* 2001: 168). This does certainly appear to be the most pragmatic approach when faced with a sizeable workforce to house. The archaeological evidence from the temporary stone shelters above the tomb of Ramesses X in the Valley of the Kings indicates their involvement in domestic activities (Paulin-Grothe and Schneider 2001: 4), an arrangement perhaps facilitated by the smaller number of workers requiring shelter.

Although it is difficult to substantiate, it is likely that the spread of airborne infectious diseases was promoted by the urban conditions experienced within settlement sites, including Giza. Overcrowding of living and occupational areas, resulting in close contact between individuals, would increase the prevalence of diseases and undermine resistance factors.

10.4.1.2. Faecal contamination of food and/or water

Sanitation arrangements, particularly within an urban community, are important factors in the control of faecal contamination of the food and water supply (Davey and Lightbody 1956: 299-328). Infection or infestation with micro-organisms and parasites occurs either by ingesting contaminated food or water, or by contact between the intact skin and infested water, facilitating the infiltration of parasites. Dysentery is a common example of an infection transmitted by the former method (Hoffman 1974; Weeks 1995), and schistosomiasis is an extremely prevalent parasitic disease distributed predominantly by the latter (Crewe and Haddock 1985: 119). Dysentery leaves little or no record in the human remains (Waldron 2000: 38), but schistosomiasis has been identified from the Predynastic era onwards (David and Archbold 2000: 160), and continues to pose an occupational and environmental hazard in Egypt today (Hicks 1983; Miller 1991b; Chapter 7: 7.1.3.). Even specialised installations possess inherent hazards as, for example, an open step well can harbour guinea worm (Miller 1989), in addition to providing a breeding ground for mosquitoes (Davey and Lightbody 1956: 186). Modern Egyptian communities persist in their misunderstanding of the role of the water table when siting latrines adjacent to water sources (Weiss 1983: 492). Although it is impossible to quantify, urbanisation is likely to focus the water supply for a community to a particular source, multiplying any inherent problems.

Settlement archaeology, water sources and sanitation

Ethnographic studies, at the beginning of the 20th century, illustrated that ninety-five percent of the inhabitants of the rural village *Saft el-Enab* were infested with one or more parasites (Khalil 1924c: 171), the associated symptoms were so common as to be regarded as normal, within the community. The human remains evidence from ancient Egypt suggests that parasite infestation of one or more kinds was uniform and that schistosomiasis, in particular, was endemic (David and Archbold 2000: 141; 157-161). The human host does not become immune, so re-infection can occur each time that the parasite comes into contact with the body. Schistosomiasis and ankylostomiasis both show a higher prevalence in rural as opposed to urban settings (Sandwith 1905: 219; Khalil 1924a: 10). This is due to the agricultural nature of rural occupations resulting in continued exposure to contaminated soil and water throughout life. The corvée workforce at Giza would have been exposed to parasite

infestation in their rural communities from an early age and their stay at Giza would contribute little to the progression or alleviation of disease. Anaemia resulting from schistosomiasis and ankylostomiasis would, however, limit the physical capabilities of the individual and predispose them to contracting other diseases (Khalil 1924b: 111). The human remains evidence from Giza shows a high prevalence of parietal thickening associated with anaemia (Chapter 12). The urbanisation of populations subjects the individuals to contamination from a new range of parasites, and exacerbates the health problems associated with sanitation and refuse disposal, a situation that demonstrates a correlation with the size of the community in question (Cohen 1989: 47).

- *Water sources*

Two wells have been located to the north of the settlement site at Giza, adjacent to the ancient Wall of the Crow, both of which could have been utilised by the resident population accommodated. It is only possible to hypothesise about the potential for disease, but comparative ethnographic evidence suggests an association between wells and their propensity to harbour guinea worm (*Dracuncula medinensis*), resulting in dracunculiasis. The fresh water and protected environment provides an ideal site for infestation (Walton *et al* 1994: 342). The parasite enters the body when contaminated water is drunk and eggs are released back into the water source, via ulcers on the ankles, when the water collector stands in the step well to replenish their containers (Ackerknecht 1965: 134; Nunn 1996: 70). Infestation causes swelling in the lower limbs. Confirmation of its existence in ancient Egypt relies upon the textual source of the Ebers papyrus (case 875: Ghalioungui 1987: 251-252; Miller 1989: 249-254; Bouchet-Bert 1998: 224-228), in addition to the isolated example of a calcified worm identified from human remains (Nunn 1996: 70). Giza may have provided the seasonal workers with a primary source of contamination, if the local community of origin utilised the Nile as a water source, as opposed to a well.

Water storage, in wells or containers, supplies a breeding ground for mosquitoes, predisposing the population to malaria. It could be postulated that the increased volume of water required for an urban population and the associated storage requirement would exacerbate malarial disease. The human remains evidence

suggests that malaria was present from at least 1200 BC (Scheidel 2001: 76), and may have been endemic in ancient Egypt (David and Archbold 2000: 157-161). The references to seasonal plagues in the Edwin Smith papyrus (Breasted 1930: 477-478; Westendorf 1999: 742-744) remain difficult to specify accurately, but could possibly refer to malaria in conjunction with other diseases. The urban practice of collecting and storing water close to the settlement would certainly exacerbate the spread of the disease if present. Water storage in *zirs* as demonstrated by the archaeological evidence at Hatnub would encourage dysentery where any lapse in personal hygiene would contaminate a shared water supply.

The evidence suggests that the Old Kingdom Nile inundation level rose to the outskirts of the Giza settlement, to the east, enabling the transportation of stone from the quarries and supplies to within the vicinity of the settled community and labour force (Lehner 1997a: 232). A line of limestone and basalt blocks has been detected during excavations under the modern suburb of *Nazlet es-Semman.* An interpretation suggests a harbour wall delineating the extent of the 'high tide' (Lehner 1997a: 232; Hawass lecture 23/11/2000). Alternatively, the blocks could represent the remains of a stock of quarried stones located at their point of disembarkation at the Giza plateau. Either way, the close proximity of the settlement to the Nile would enable the community to take advantage of the water supply for drinking and bathing, recreating the conditions for parasite infestation encountered in rural settings where the Nile was frequently the sole source of water. The inhabitants at, for example, Semna and Buhen would have faced similar hazards due to the locality of the settlements.

- *Sanitation and waste disposal*

Excavations at Giza have yet to identify any archaeological evidence for the existence of latrines. The evidence from Lahun and Amarna also implies that no specific arrangements were made for the disposal of human waste (Dixon 1972: 648). The identification of latrines in elite mastabas from the 2nd Dynasty suggests that their presence in a domestic setting would be anticipated (Dixon 1972: 647-648), although it is likely that this was an elite provision not extended to the general community. Ethnographic evidence from villages in Egypt indicates that generally no toilet facilities or sanitation system are available to the communities, who use animal sheds

and the fields for these purposes (Morsy 1993: 42-43). Human waste consequently enters the irrigation system and the population is infested with parasites. Although members of the community are aware that the water supply is contaminated with, for example, schistosomiasis, they take a fatalistic view to the inevitability of contracting the disease (Morsy 1993: 43). Without the comprehensive excavation of further urban centres it is not possible to surmise if specific arrangements were made to cope with the requirements of an urban community. The anticipated population density of urban situations, combined with this apparent lack of sanitary arrangements, would lead one to suspect that diarrhoeal infections were commonplace, in addition to parasite infestation. Although these diseases would have existed within a rural context, the potential for infecting a large community depended upon an increased population density using a limited number of water sources or food suppliers. Recent studies (Miller 1984: 439) and personal experience on desert-based archaeological excavations indicate that the rapid spread of dysentery throughout a previously healthy community remains a hazard, where a communal water source and food preparation area are operational. Although the identification of amoebic and bacterial micro organisms remains problematic, parasites can be isolated from ancient latrine deposits (Pike 1967: 184-188), as can nutritional information (Brothwell 1969: 539), but, to date, the evidence from Giza has not allowed the opportunity for testing. It seems inconceivable that a potential population in excess of 20,000 people would not have designated a specific area for the disposal of human waste, so the evidence may be discovered during future excavations.

The content and disposal of refuse can reflect both domestic and economic activities, values and social differentiation (Hoffman 1974: 36). Caution is required in the identification of what constitutes 'waste' or 'refuse' in an ancient context (Moore 1982: 74-79; Brooks and Yellen 1987), admirably demonstrated by the practice in agricultural communities of storing human and animal waste adjacent to the domestic setting. The waste is perceived as a valuable commodity, important for crop fertilisation (Miller 1984: 438). A public health programme, in the Delta during the 20th century, encountered resistance when advising against this practice, as it would appear that economy was more important than reducing the high infant mortality rates resulting from dysentery (Weir *et al* 1952; Miller 1990: 137). The non-agricultural pursuits dominating the activities in urban centres, including Giza, may have negated

the value of this practice, reducing the prevalence of disease from this source. The workmen's village at Amarna accommodated animals within their entrance rooms, and a system of pens has been identified within the settlement suggesting that human and animal proximity remained close within this particular urban setting. It would be expected that state-planning would incorporate a system for the disposal of household waste within its design. The evidence from Lahun indicates the construction of a street drainage system designed to facilitate the removal of waste from household areas (Petrie 1891: 8). A drain, possibly similar in function, has been identified at Giza located in the centre of the main thoroughfare (Lehner 2000b: 2). It has also been noted that the street surface was kept clear from debris in antiquity, suggesting activity on a community level to maintain a standard of hygiene in the public domain.

The accumulation of household rubbish appears to be a random arrangement at Giza. Two specific tips have been identified within the settlement, but the content of room fill suggests additional deposition within industrial and household areas whilst occupation continued. A similar pattern has been observed at Lahun, where discard was concentrated beyond the north perimeter wall or left in abandoned buildings (Dixon 1972: 648), and at Amarna where areas to the east and south of the workmen's village were utilised (Kemp and Vogelsang-Eastwood 2001: 254). Hoffman (1974: 43-44), during excavations at Hierakonpolis, observed that, whereas disposal on the floor of the houses was apparent in the small house units, an effort was made to keep the elite structures clear. It has been suggested that in New Kingdom Deir el-Medina a system of waste disposal must have been introduced, as floor levels remained consistent for 400 years (Dixon 1972: 649). The combination of sites for refuse accumulation suggests an informal approach to disposal, that, despite the possibility for interpretative and cultural differences in the classification of waste, carried the propensity for disease transmission within the domestic setting. It would be expected that the formal nature of the planning of the site at Giza would facilitate the incorporation of a system for the disposal of waste, if the value of such systems were appreciated at the time.

10.4.1.3. Vectors

A complex relationship exists between urbanisation and those diseases spread by vectors. If the conditions within the settlement favour the survival of the vector, then

an increase in the level of infection would be expected (Boyd 1972: 348). As indicated above (10.4.1.2.), water storage encourages mosquitoes and the accumulation of waste increases the prevalence of flies. Ancient Egypt, in common with modern Egypt, was subject to widespread eye infections transmitted by flies (Sandison 1967: 457-463; Feacham *et al* 1978; Weiss 1983). The oases today are particularly affected where their isolation and agricultural practices increase the prevalence of flies. It can only be surmised that the ancient occupants of, for example, Gurob and Dakhla were affected similarly. Trachoma, a virus causing inflammation of the eye, frequently resulting in blindness, is spread due to poor personal and public hygiene and flies, where irritation from sun, dust, wind, or smoke predisposes the individual to infection (MacCallan 1913: 3-14). It is thought to have been endemic in ancient Egypt, possibly included in the Ebers papyrus (case 346: Ghalioungui 1987: 105) and prompting the use of eye paint, containing copper compounds to deter transmission (Feigenbaum 1957; Sandison 1967: 458). Ninety-five percent of the Egyptian population in the early 1900s was infected with trachoma, a greater prevalence being noted in urban situations (MacCallan 1913: 3). In the light of these figures, and the fact that flies are attracted to smaller populations in addition to larger ones, it is difficult to state that the rate of infection in the urban setting is substantially increased (Cohen 1989: 40).

Settlement archaeology and vectors

In common with urban centres throughout Egypt it would be expected that the occupants at Giza were subjected to the inconvenience caused by the presence of flies and vermin, encouraged by the concentration of population, food and water supplies and waste products. There is little archaeological evidence to support this assumption and the effects in terms of the pattern of disease remain impossible to predict.

10.4.1.4. Contact

A greater population density increases the spread of infections transmitted by contact (Davey and Lightbody 1956: 13), and overcrowded living and working conditions impact directly upon those rates of transmission. Urban conditions are favourable as they increase the proximity between community members, and the compact housing units demonstrated by the archaeological evidence for workers' settlements would provide ideal conditions for cross-contamination. Unfortunately the range of diseases

transmitted by contact, including syphilis and leprosy, have not been identified, to date, from the human remains in ancient Egypt (Nunn 2001: 398). Although both diseases potentially leave skeletal markers, post depositional factors and retrieval limitations inhibit their identification. Syphilis potentially promotes characteristic skeletal changes that would facilitate recognition of the disease, if present within the population and if subject to comprehensive sampling. The identification of leprosy requires the examination of the hands and feet (Roberts 2000: 48), the small bones of which often either deteriorate during burial or are damaged and lost during excavation. The presence of the human form of tuberculosis within a population appears to provide a degree of immunity against leprosy (Waldron 1989: 61), where urbanisation increased the prevalence of tuberculosis, the interrelationship between the two diseases may have resulted in a suppression of leprosy in urban environments (Filer 1995: 72). It is thought that smallpox developed as a direct result of urbanisation (Cohen 1989: 49-50), indicating clearly the relationship between population density and the transmission of infectious diseases. Smallpox has been only tentatively identified in the human remains evidence from ancient Egypt (Ruffer and Ferguson 1967: 348; Sandison 1973: 218), and so its impact upon the community remains conjectural.

Contact between human and animal populations constitutes a significant factor in the spread of infectious diseases. Urbanisation might be expected to reduce the direct contact with, for example, herd animals characteristic of a rural existence, but the evidence from, for example, Deir el-Medina, Amarna and Elephantine suggests that animals were housed within the settlement and even within the domestic unit itself. In addition to contact with herd animals, the attraction of vermin to urban areas discussed above (10.4.1.2.; 10.4.1.3.) would pose a range of health hazards. Baker (1997: 112) suggests the presence and high infection rate of cryptococcosis, a disease with similar symptoms to tuberculosis but transmitted by pigeons, in the human remains evidence from the urban centre of Abydos. These results must be subject to the range of survival and interpretative limitations associated with the identification of any disease from the human remains. A comparison with the low prevalence of infection amongst rural Nubian populations has resulted in the suggestion that an urban relationship between the number of pigeons, their proximity to the human population and the transmission of the disease is apparent.

Settlement archaeology and diseases spread by contact

Although difficult to qualify, it would be expected that the over-crowding apparent within the living and working locations at Giza, in common with other urban settlements, would result in an increased prevalence in the diseases transmitted through contact. As with the comparable expectations proposed for airborne infections (above: 10.4.1.1.) assumptions are impossible to test, let alone confirm without supporting textual or human remains data.

Despite the anticipated reduction in human contact with animals within an urban setting, the unusually high prevalence of cattle bone identified during excavations at Giza (Redding 2000: 8) requires discussion. Diseases, notably bovine tuberculosis, can be transmitted from animals to humans. An established system of cattle provision is evident at Giza, where meat was transported to the site, from village sites in the Delta or Nile valley, such as *Kom el-Hisn*, for slaughter and processing (Redding 1994). Whereas contact with the live animal during herding was reduced, the urban community at Giza, with its demand for beef, centralised the processes of slaughter, processing, and subsequent consumption, potentially increasing the prevalence of diseases contracted by contact and ingestion in these situations. Bovine tuberculosis results from the consumption of infected milk and dairy products (Waldron 2000: 35); the domestication of cattle together with the evidence for dairy products in the diet (Ghalioungui 1973: 120-130), indicates that this disease could have posed a problem in ancient Egypt (Hare 1967: 117). Herdsmen were, on occasion, depicted in tomb scenes in an emaciated condition (Blackman 1914: pl. 9; 1915: pl. 3), and it is possible that the artist was representing the characteristic symptoms of bovine tuberculosis contracted as a result of their occupation (Chapter 7: 7.1.2.). Bovine tuberculosis, in addition to its human form, affects the skeleton, facilitating the identification of disease from the human remains evidence (Hare 1967: 126; Waldron 2000: 35). Although the data from Giza has provided no evidence for tuberculosis to date, the pathology has yet to be studied in detail.

10.5. Urbanisation and population resistance factors

Infection is likely to occur when the balance between the prevalence and virulence of organisms and the degree of resistance within the population alters (Sandison 1973: 214). Significantly, disease does not uniformly ensue from exposure to infection, as

population resistance factors affect individual and community susceptibility (Powell 1988: 41-42). Age, degree of natural immunity, and the general health of the individual are amongst the specific factors requiring consideration in assessing susceptibility to disease (Boyd 1972: 348-50).

In ancient Egypt, the corvée system dictated that workers were selected from a wide geographical area and brought together for the purposes of occupation (Fakhry 1952: Eyre 1987a: 18-20; Shaw 1998: 247), which in turn influenced their social and living arrangements. This situation is highly favourable for the spread of infectious diseases and can be illustrated by, for example, epidemics associated with the transitional nature of populations along trade routes (Kuhnke 1990: 49). Infections from small communities can reach large populations with a migratory workforce. Varying degrees of exposure to diseases and levels of immunity will render individuals vulnerable, when confronted with organisms not experienced in their home environment. The pattern of the rise and fall of incidence of a particular disease is precipitated by the movement of people (Davey and Lightbody 1956: 14). For example, tuberculosis in rural communities initially affects more men than women due to the social contact and travel opportunities associated with the male role (Davey and Lightbody 1956: 94).

Epidemics require a rapid rate of spread to new victims to ensure the success of the disease: the hosts are subsequently killed or granted a life-time of immunity. The efficacy of specific diseases requires constant births or immigration to keep the momentum at an appropriate level (Cohen 1989: 48). It has been estimated that between 5000-40,000 new hosts are required per year to sustain an epidemic, depending upon the disease (Cohen 1989: 49). If these conditions are not fulfilled, the supply of susceptible victims decline and 'herd immunity' arises, providing resistance to the disease at a community level (Davey and Lightbody 1956: 14). Settled situations can lead to genetically acquired immunity (Cohen 1989: 39), and, whereas the initial urbanisation process will increase the incidence of disease, provided that the community is not subject to substantial population changes, 'herd immunity' can provide subsequent protection. The use of a seasonal labour force, subject to periodic rotation, in ancient Egypt, could have had catastrophic effects.

10.5.1. *Resistance factors and the permanent workforce at Giza*

The current working hypothesis proposes that a permanent sector of the workforce at Giza comprised a core of professionals, overseers, scribes, skilled craftsmen and food producers, supplemented by their dependants (Lehner 1997a: 224). The evidence from the cemetery supports this suggestion, where tomb structures accommodated family groups, and prosopography and autobiographies indicate the owners' role within the community. In common with settled groups in urban centres throughout the country, these permanent occupants of the Giza site would have been susceptible to a range of infectious diseases, and their proximity to one another within the settlement would have facilitated the spread of these infections. Infants, for instance, were possibly increasingly susceptible to measles and tuberculosis and the elderly members of the community vulnerable to, for example, poliomyelitis. It would be anticipated that any children born into the workers' community would have faced a higher risk of fatality than their rural contemporaries, based on observations that urbanisation in 19th century Europe was most hazardous for infants (Kearns 1989: 11). Unfortunately the limited evidence from the human remains at Giza neither supports nor refutes these expectations (Chapter 12), and speculations must remain cautious. What remains certain is that the capability of the permanent workforce to develop 'herd immunity' would be directly influenced by the influx of the seasonal workers.

10.5.2. *Resistance factors and the seasonal workforce at Giza*

The second and considerably larger division of the workforce is thought to have comprised the seasonal component of corvée labour. The actual size of this workforce has been the subject of much discussion initiated by Herodotus with his renowned reference to 100,000 slaves (De Sélincourt 1996: 132). It is now accepted that these numbers were exaggerated (Lehner 1997a: 224), and that the allusion to slaves was likely to have been a cultural misunderstanding, as the existence of slavery in the ancient Egyptian Old Kingdom has yet to be substantiated convincingly (Westerman 1929; Bakir 1947; Lorton 1977). Recent calculations have estimated that the required labour force would range from 20-25,000 at any one time, with a possible three-month rotation system (Lehner 1997a: 224), although these demographic assumptions remain conjectural. An additional, entirely hypothetical, suggestion states that larger figures (up to 40,000) would be required in the earlier years of construction whilst the surface area of the pyramid was at its greatest (Tyldesley

2000: 73). Whatever the exact figures involved the size of the pyramids and the established time frame for their completion indicates that we are clearly considering a substantial workforce. Comparative evidence has highlighted the demographic implications of a corvée system, including an increase in the prevalence of infections, diseases and fatalities, and a decrease in the birth rate associated with the prolonged absence from home (Scheidel 2001: 202). The seasonal rotation system would render the population susceptible to epidemics of infectious diseases, as new hosts were constantly available for the perpetuation of transmission.

The textual evidence suggests a preponderance of low status males as prime candidates for conscription (Eyre 1987a: 19), and it would be expected that they would consist of predominantly young and comparatively healthy individuals, if efficiency and productivity were to be maximised. There is limited textual evidence from the Brooklyn papyrus confirming that women were corvéed (Eyre 1987a: 38), but it remains unclear as to whether construction projects formed part of their tasks. The inclusion of shabtis in female burials would suggest that corvée in the Afterlife was equally important to women as to the men (Robins 1993: 122). The human remains evidence from Giza confirms the presence of women, as 50% of the bodies recovered to date are female (Tyldesley 2000: 78). If contemporary with the settlement site, then the assumption can be made that women were involved in some capacity at Giza. They were buried, however, in association with the family units representing the permanent, skilled workforce as opposed to comprising a female component of unskilled corvée labour. It would be anticipated that the conscripted duties formed part of an active working life and that the age of the participants was favourable both for manual capabilities and resistance to disease.

Based on these assumptions, the seasonal workforce comprised 20-25,000, probably predominantly male, conscripted individuals from a wide geographical area. Their habitual rural environment involved a low population density, although communities may have occupied small and closely packed units, and agricultural pursuits. The change in social environment on arrival at Giza would have had direct health implications, by rendering the participants susceptible to the spread of infectious diseases, inherent in the increased population conglomeration. In addition, the seasonal rotation of workers could have precipitated epidemics, where the

introduction of new diseases impacted upon a community with varying resistance. Whereas permanent settlers alone would be able to overcome the initial problems associated with urbanisation and even develop a degree of 'herd immunity', the population change instigated by the influx of seasonal workers would have introduced organisms with the potential to infect the permanent and seasonal communities alike.

10.5.3. *Resistance factors and nutrition*

Adequate nutrition is an important aspect in the improvement of population resilience to disease. Poor nutrition not only increases the likelihood of contracting diseases but also exacerbates the severity of the symptoms (Khalil 1977: 24; Learmonth 1978), a factor instrumental in the control of measles and tuberculosis in recent times (Boyd 1972: 349). Potential malnutrition has been identified from the examination of enamel hypoplasia, amongst the human remains in ancient Egypt (Chapter 12: 12.2.). The general health of the individual is important and the existence of chronic infections or parasite infestations will increase their susceptibility to contracting other diseases. If urbanisation leads to an improved or impaired nutritional status for the individual and the community, then resistance to disease will follow the same pattern.

The permanent community at Giza may have enjoyed a privileged position benefiting from the temple system of food production that evidence suggests was both varied and plentiful (Badawy 1967; Kemp 1972b; Lehner 1997a: 202; 228-229; 2000c: 295-296). Whether this advantage filtered down to the manual labourers is questionable and is unlikely to be determined from any future examination of the human remains, due to the seasonal nature of their employment, and their consequently temporary participation in supply consumption.

Herodotus, with information based on very doubtful sources, states that the pyramid builders lived on a diet of radishes, onions and leeks (De Sélincourt 1996: 132). Saffiro (1973: 301) has identified the typical ancient Egyptian diet to include predominantly bread, fruit, vegetable and fish, but little meat as the animals were required to work and the meat was difficult to store. Conversely, drying and salting processes for fish and meat are attested by the artistic evidence (Ikram 2000: 656-671), and possibly also from the archaeological evidence at Giza (Lehner 1997a: 237). The faunal evidence from Giza has revealed a prevalence of fowl and fish, with an

unusually high ratio of cattle to sheep and goats (Redding 2000: 8). This high protein diet would be in keeping with the nutritional requirements for a hard labouring community (Spurr 1983) and would have assisted in the maintenance of an effective immune system. Fragments of small fish have been identified, possibly representing the remains of salted and dried snacks, as eaten in Egypt today, providing an excellent source of salt and protein. The human remains evidence even for the more elite and permanent members of the workforce challenges this seemingly high protein intake (Chapter 12). The evidence from Kom Rabiʿa indicate diversity in the protein intake of the inhabitants including cattle, pig, sheep and fish and fowl from the Nile (Ghaleb 1995). It is of course possible that a high protein diet was not unique to the inhabitants at Giza, but without substantiating human remains evidence it is not possible to tell.

The archaeological and archaeobotanical evidence from Giza confirms that bread played an important role in the diet of the workforce, and has enabled a reconstruction of the baking techniques. The archaeological evidence for bakeries accurately reflects the tomb paintings in their pictorial description of the process (Montet 1925; Vandier 1964; Lehner 1997a: 237), where heated moulds were depicted positioned in sand depressions for baking. The resulting loaves were high in carbohydrate and each loaf was sufficient for consumption by several people (Roberts 1995; Lehner 1997a: 236-237). To date, seven bakeries have been excavated (Lehner 2000b 6-7) and the presence of large quantities of bread moulds in rubbish deposits attests to the manufacture of bread on a substantial scale, within the settlement. The archaeological evidence indicates that replacement, larger capacity bakeries were constructed on top of older more domestic installations (Lehner 1999b: 9), suggesting abandonment or a revision of output requirement, possibly coinciding with an influx of workers. In many respects the diet at Giza was potentially more varied than that experienced in rural Egypt and compared favourably to the workers habitual diet. State provisioning, attested by historical texts (Kemp 1986; 1989: 117-128; Miller 1991a; Leprohon 1995), would appear to have been in operation at Giza, where the absence of evidence for hunted species suggests that the population was not involved in procuring their own food (Redding 2000: 10). It is possible that at least sectors of the workforce at Giza may have experienced the beneficial effects of an improved diet, to an extent balancing out the negative aspects of urbanisation. Conclusions must be cautious

where it would appear that, if the cemetery population were to relate to that of the settlement, the archaeobotanical and faunal remains contradict the human remains evidence (Chapter 12).

10.5.4. *Resistance factors and population density and diversity*

Settled communities, as opposed to nomadic populations, offer a stable environment for the support of the sick and disabled. More recent evidence suggests that urban communities provide a magnet for the disadvantaged for this very reason (Waldron 2000: 41). Urbanisation and its associated increase in population density would expand the experience of the community in managing diseases and injuries, resulting in an increased standardisation in practice (Fábrega 1997: 104). A co-ordinated system for handling the sick and burying the dead is likely to develop out of necessity, in turn prompting the development of medical personnel and specialisation (Fábrega 1997: 96; 102). The medical papyri may represent a tangible response to this increasing medical awareness and desire to standardise information. It is unfortunate that the evidence from ancient Egypt is unable to illustrate any associated diminishing in the fatalistic acceptance of disease that would be expected with even the limited success that the interaction by 'healers' would provide.

The process of urbanisation increases the diversity of the population in addition to its density. Although not relating to the direct implications of disease transmission, the community's variability engendered by urbanisation potentially reduced the prevalence of congenital abnormalities, by limiting the necessity for inbreeding (Brothwell 1972: 354). It is not possible to evaluate the importance of kinship ties in the formation of relationships that possibly overrode the opportunities provided by an alteration in population diversity. The social environment at Giza, consisting of a large percentage of temporary labourers, was unusual in its population composition, and the impact on the more permanent members is impossible to appreciate from the limited information available from the human remains at the site.

To summarise, the evidence provided by the study of settlement archaeology is particularly informative about the associated living and working conditions experienced by the workers. The relationship between urbanisation and health is a complex one, dependant upon various factors including; habitational space and

facilities, the disposal of waste and proximity to animals. The non-elite workforces were housed according to their occupation, either in distinct workmen's villages as at Amarna and Deir el-Medina or in temporary accommodation attendant to corvée duties. The conditions and facilities within the specific sites demonstrate the physical environment experienced by the non-elite members of the community. The movement and relocation of individuals for labouring purposes and overcrowded living conditions would facilitate the transmission of infectious diseases. Water sources, diet and sanitation would influence parasite infestation, nutritional resistance to disease and bacterial infections. On balance, the short or long-term urbanisation of working communities would have a detrimental impact upon health.

Chapter 11

Archaeological evidence and occupational health issues

The elusive nature of the non-elite individual in the ancient record prompts the consideration of their activities and occupations as indicators of the health hazards faced. Craft specialisation and the frequent tendency towards the kin-related inheritance of occupation (Eyre 1987a: 38), led to individual and familial involvement in specific activities. Textual and artistic data regarding the non-elite in ancient Egypt are connected predominantly with this occupational role within society, highlighting a task-related identity in preference to individual or personal indicators. To a great extent the individual was defined by their occupation, which automatically dictated their relative social status, living environment and exposure to occupation-related diseases and injuries.

The archaeological evidence for occupations has been incorporated into a detailed catalogue, together with comparative data from the alternative sources of evidence (Nicholson and Shaw 2000), a summary of key examples is given in table 5 (Appendix 1). In many instances it is the end result of the occupation, in terms of architectural achievement or artefact, that provides the opportunity to recreate the processes required for achieving the finished product. For example, to understand pyramid building, attempts have been made to reconstruct the technology and manpower requirements necessary for fulfilling the constructional project (on a much smaller scale) (Lehner 1997a: 208-209). Of course this is hazardous in procedural terms, as any modern interpretation of an ancient operation is unlikely to bear much relation to reality. The archaeological evidence does, however, play an important role in supporting or refuting the detailed artistic representations of occupations in progress, which although not meaningful in organisational terms, provide an insight into the procedures and equipment utilised during production (Peck 1996b; Chapter 9). The textual evidence for occupations provides a selective and elite, ideological perspective on the tasks involved, with little information regarding the workforce, beyond a list of titles (Chapter 2). Quarry marks at constructional sites provide a notable exception in giving an indication of manpower organisation (Arnold 1990). But the archaeological evidence is required to highlight the actual conditions

experienced within for example, the hard stone quarries at Aswan, devoid of the ideological rhetoric adopted by expedition texts designed to emphasise the success of the expedition and the excellence of the pharaoh.

Interpretation of the archaeological data for occupations has tended to focus upon the technological and scientific analysis required to reconstruct equipment and methodology (for example: Roberts 1995; Lehner 1997a; 1999a), with little consideration for the welfare of the workforce. A notable exception is included in the experimentation in stone vessel manufacture performed by Stocks (1993: 601), where he noted the associated inhalation of small dust particles and consequent lung damage. The practice of experimental archaeology is highly valuable not only in technological terms, but also in highlighting the problems and logistics involved. Unlike the theoretical models for public health (Chapter 10), the hypotheses for occupational environments and stresses can be tested. To an extent the number of participants required to transport building blocks can be estimated, albeit incorporating a modern workforce (for example, Lehner 1997a: 208-211), and the dust inhalation associated with stone cutting can be experienced first hand. As with any hypothetical model it would be a mistake to assume that our methodology equates directly to that of the ancient Egyptians. For instance, there are no ancient records that confirm the size of the workforce involved in any of the tasks involved in pyramid construction. Our inherent cultural approach to task-solving focuses upon efficiency and minimal involvement. We calculate the fewest participants required in an attempt to reproduce the ancient conditions (Lehner 1997a: 208-209), but there is no evidence to suggest that minimal manpower requirements were a concern in ancient Egypt, as indeed in modern Egypt. On the contrary, the availability of sizeable numbers and the ideological tendency to emphasise the complexity of the task, to ascribe added value to the completed project and the power of the King, suggests otherwise. It might be apparent that the ancient workforce was larger than strictly required and this impacts directly upon the potential for physical stress experienced by the individuals.

The study of occupational health issues requires an evaluation of the physical demands of specific activities and their associated environment. The combination of artistic sources for occupations (Chapter 9) and archaeological evidence, in terms of

artefacts and industrial settings, provides a comprehensive indication of the physical environment experienced by the individual involved in a variety of occupations. The potential impact of specific occupations on the individual, and the evidence utilised to arrive at the various hypotheses are tabulated in table 5 (Appendix 1).

Craft and industrial specialisation emerged with the formation of the state in ancient Egypt (Trigger 1972: 578; Eyre 1987a: 8). The standard of technological expertise demonstrated by artefactual evidence has been thought to denote a concentration in activity (Valbelle 1990: 31). Textual evidence from the New Kingdom confirms that occupations including herdsmen, coppersmiths, sandal-makers and gardeners were full-time activities (BM 10068: Peet 1930: 87-98). The important factor for the purpose of understanding occupations and their potential impact upon health is that specialisation indicates an involvement in a particular occupation for a prolonged length of time. This situation exposes the individual to the detrimental effects of repeated actions in specific environments, and raises their susceptibility to the acquirement of occupation-related diseases and/or degenerative conditions. Occupations have the potential to impact on health in a direct or indirect manner, in terms of injuries or the development of more insidious debilities. To avoid repetition with Chapter 9 which considers the artistic data for occupations, the remaining sections of this chapter concentrate on an area of activity absent from the artistic evidence: that of pyramid building and its associated activities. The archaeological evidence has been utilised to construct a set of hypotheses regarding the health implications of this particular occupation and forms a natural progression from the information in Chapter 10 in its summary of public issues associated with the workforce at Giza.

11.1. The archaeological evidence for pyramid building and the potential health issues

In the absence of documentary evidence for pyramid construction, the building procedures are deduced from the archaeological remains of the structure itself. The logistics have been analysed in great detail (Arnold 1991; Lehner 1997a), and any technological appreciation takes for granted the availability and co-operation of a huge workforce. As mentioned above, in the absence of direct evidence and the uncertainty of hypothetical models, suppositions about injuries and fatalities during

pyramid construction, although rooted in common sense, are conjectural. The archaeological evidence for working environments does suggest the scope of potential health issues associated with the various procedures involved in quarrying, transportation and construction. The following information is extracted from table 5 (Appendix 1) and included here for clarity:

Occupation	**Archaeological evidence**	**Physical environment**	**Potential health implications**
Quarrying	Quarry sites with tool marks, including: Giza plateau (Lehner 1997a: 206-207) and Gebel Gulab, Aswan (Aston *et al* 2000: 17). Settlements at quarry sites, eg. Gebel el-Asr (Engelbach 1933). Tools including: dolerite pounders (Aston *et al* 2000: 5-17) and copper chisels (Emery 1949: 42-47).	Exposed desert conditions in temporary shelters, often remote and relying upon supply routes for water and food. The famine depictions at the Unas causeway may represent hardship associated with quarrying expeditions (Vandier 1936; Aston *et al* 2000: 18). Pounders used to cut rock channels. Hazards associated with manoeuvring blocks. Rock falls. Snakes and scorpions.	Injuries and cuts to hands and feet. Fractures and Complications. Eye injuries. Nystagmus from poor lighting. Silicosis from dust inhalation. Crushing injuries. Infectious diseases from overcrowding. Supplies-nutrition. Snake and scorpion bites. Squatting facets from cramped positioning.
Transport ation of stone -by river	Harbour wall at Giza, denoting disembarkation area for stone during inundation (Lehner 1997a: 232).	Hazards associated with loading and unloading and manoeuvring blocks. Crocodiles. Water-borne diseases.	Crushing injuries. Fractures and Complications. Drowning Schistosomiasis.
Transport ation of stone - by land	Quarry roads eg. Gebel el-Asr to Tushka (Engelbach 1938: 388-9; Harrell and Brown 1994). (Arnold 1991: 79-101; Lehner 1997a: 202-3; Aston *et al* 2000: 18-20). Ramps eg. Gebel el-Asr, Gebel el-Silsila (Aston *et al* 2000: 19-20). Draft cattle remains at 11th Dynasty Mentuhotep complex, Deir el-Bahri (Lehner 1997a: 203).	Levers, ramps and sledges used in transportation. Teams of men and cattle used to drag stone (Lehner 1997a: 202-3). Maximum 20 men required to pull 2 ton block on sledge without gradient (Lehner 1997a: 209).	Labouring in hot climate- dehydration. Crushing injuries. Strains. Rope burns.

Occupation	Archaeological evidence	Physical environment	Potential health implications
Construction in stone	Stone monuments (Arnold 1991: Isler 1992). Evidence for technology (Arnold 1991: 66-116) eg. toolmarks on casing stones at Giza (Lehner 1997a: 221). Pyramid towns including Giza and Lahun (Petrie 1890; 1891; Lehner 1997a; 230). Experimental archaeology (Lehner 1997a: 208-211).	Handling and transporting heavy weights. Working at heights. Danger from falling blocks and debris. Experimental archaeology observed high levels of dust inhalation	Labouring in hot climate- dehydration. Multiple trauma from falling from heights. Crushing injuries. Injuries and cuts to hands and feet. Silicosis from dust inhalation. Eye injuries.

11.1.1. *Direct health implications*

The evidence suggests that the potential for injuries whilst engaged in the occupations associated with pyramid building would have been considerable. Hazards including cuts, fractures, crushing injuries, snake and scorpion bites and strains would have been prevalent, although how prevalent it is not possible to say. Additional direct implications would include the likelihood of rope burns and the possibility of drowning whilst transporting stone by land and river respectively. The traumatic conditions detailed by the Edwin Smith papyrus provide the most convincing supporting evidence for the occurrence of occupation-related injuries of the type expected in an industrial setting (Chapter 5: 5.1.). The Brooklyn papyrus detailing snake bites (Sauneron 1989) and amuletic decrees highlighting the hazards associated with crocodiles (Edwards 1960) indicate a preoccupation with the management of these incidents. Nystagmus would have constituted a complication for those labouring under the poor lighting conditions associated with quarries, mines and tombs. The temporary symptoms comprise vertigo, a sluggish reaction to changes in light levels with photophobia and oscillations of the eyeballs, rendering focusing on any object impossible (Taylor 1875: 821). A specific request for the restoration of eyesight was recorded on a stela at Deir el-Medina (Demarée and Janssen 1982; Quirke 1992: 135), indicating the possibility that occupation-related blindness was a consideration for the tomb builders (Chapter 3: 3.4.).

11.1.2 *Indirect health implications*

The working and living environment necessitated by the quarrying of stone and pyramid construction would have compromised the health of the workforces in many ways. Before the advent of antibiotics, the desert location would have rendered even minor wounds susceptible to bacterial infections. These conditions were often fatal and were, for example, problematic amongst Second World War soldiers in the Western Desert (Hunter 1978: 688), potentially presenting a similar challenge to the ancient Egyptians. The possibility that the ancient community was unwittingly administering themselves antibiotics in the form of tetracycline from contaminated grain, used in the manufacture of bread and beer, is under investigation (Armelagos and Mills 1993: 9-10), but remains unsubstantiated both as fact and in potential effect. Labouring in the heat leads to rapid dehydration if sufficient quantities of water are not available and consumed. Once again observations upon troops in desert conditions noted two forms of dehydration: the first resulted in heat exhaustion, cramps and weight loss, and the second in increased sweating and polyuria (Ladell *et al* 1944: 492-495; 527-528). Both conditions are serious if not rectified with fluids and saline replacement and would have posed an ongoing problem for the ancient workforces. Personal observation of present day Egyptian agricultural and Jordanian *Bedouin* workforces has highlighted their practice of minimal fluid consumption during the day. Fluid replacement is achieved in the evening, but the prevalence of renal calculi amongst the groups suggests that the effects of chronic dehydration were not avoided. Although the Ebers papyrus devoted a section to urinary disorders (cases 261-283: Ghalioungui 1987: 87-91), there is no obvious reference to renal calculi, as the associated acute abdominal pain may have confused the issue. The archaeological evidence from hard stone quarries suggests that the stone was dressed at the quarry site as opposed to the construction location (Arnold 1991: 52). Presumably in the attempt to reduce the weight of transported stone to the minimum, this practice would expose the skilled workforce of dressers to the detrimental environmental conditions, especially in the heat of the Upper Egyptian quarries, experienced by the quarry workers. As would be expected, logistics took precedence over physical comfort.

The inhalation of sand particles presents an inherent health hazard when labouring in desert conditions and predisposes the individual to silicosis (Tapp *et al* 1975). Stone working exacerbates this problem where the working environment, particularly in an

enclosed quarry (Arnold 1991: 31), becomes laden with dust. It is possible that dust-related lung diseases were endemic in ancient Egypt (David and Archbold 2000: 107), caused by a combination of general environmental and specific occupational factors. The quarrying and stone working activities required for the construction of the pyramids would expose the workforce to respiratory damage and disease.

Repetitive occupational activities promote skeletal responses in areas of stress (Hunter 1978: 764), although caution is required in associating anatomical modifications with specific tasks (Waldron 1994: 93-94). Osteo-arthritic spondilitis may develop as a result of persistent load carrying (Ruffer 1918; Hunter 1978: 771-776). The human remains evidence from Giza, even amongst the more elite administrators, indicates several cases of spinal vertebral compression, particularly in the lumbar region, associated with lifting and carrying heavy weights (Sarry el-Din pers comm). It would be expected that the transportation of bricks and stones for pyramid construction would stress the physical endurance of the workforce and leave an indication of these activities in the skeletal record. The physical attitude adopted by the workers during their occupation, specifically the squatting position maintained by many trades, including quarrying (Arnold 1991: 32), would have encouraged skeletal changes to the knee-joints. The archaeological evidence from the Old Kingdom 'Khafra' quarry indicates a squatting trench of 60cms wide (Arnold 1991: 31), that would have severely restricted the movement of the occupant. A high prevalence of squatting facets of the talus and tibia in ancient Egyptian human remains has been noted (Satinoff 1973a: 210-212), possibly directly related to this habitual pose. The human remains evidence from Giza indicates the presence of osteo-arthritis in the knee joints in a number of cases, thought to relate to squatting positions adopted early in life and continuing into adulthood. If this position was habitual, as the evidence suggests, it is difficult to anticipate any increase in susceptibility imposed by the duties of pyramid construction and specifically the restrictive quarrying environment.

To summarise, the archaeological evidence suggests that the activities involved in stone quarrying and construction would have exposed the workers to a range of direct and indirect health hazards. The prevalence of the injuries and diseases mentioned are, however, impossible to substantiate.

Chapter 12

The human remains evidence

Ancient burial procedures and the subsequent chances of evidential survival have complicated the study of the non-elite through the human remains evidence. In many cases the non-elite are simply absent from the record, either due to the failure in identifying burial location, poor preservation or an historical lack of interest within Egyptology. Non-elite cemeteries located on the perimeter of ritual sites, for example, have been robbed and are thus deemed uninformative and consequently remain undocumented (Bourriau 2001: 4). The dearth of data has prompted suggestions that the non-elite may not have been buried at all, but simply deposited in the desert, fields or river (Delrue 2001: 27). A more detailed discussion of the under-representation of the non-elite in the funerary record is contributed in Chapter 16.

The absence of evidence results in the unfortunate restriction of apposite data for this chapter, as we simply do not have a choice of cemeteries containing non-elite workforces to interpret. The absence of the human remains from cemetery sites such as Amarna and Kom Rabiʿa leaves a regrettable breach in our understanding of non-elite community health. Compromises have had to be made where, for example, the information from Saqqara has been incorporated for rarity value as an excavated non-elite cemetery, although the data comprises a combination of periods within the fragmentary remains. The reconstruction of individuals remains problematic, and naturally there can be no association between the remains and their occupation. The information from Giza has been utilised as it provides a unique opportunity to evaluate occupational health where the role of the individual within society is confirmed by funerary inscriptions, and the associated settlement provides supporting information on potential health issues (Chapter 10). Unfortunately, but not surprisingly, the cemetery at Giza pertains to the administrative workers as opposed to their corvéed counterparts. The slain soldiers of Neb-ḥetep-Re have been included as a valuable contribution to an understanding of the hazards of warfare. Additional information from Abydos, Saqqara and the eastern cemetery at Deir el-Medina have been used to provide comparative material, although it is recognised that the fragmentary nature of the evidence inevitably introduces varying issues of relative

status (Abydos) and information from beyond the time-frame set for this thesis (Anubieion sample). The substantial sample of data from excavations at Wadi Halfa, Nubia is included, but it is recognised that the evidence pertains to disparate time periods and the sampling techniques and recording methods limited subsequent palaeopathological studies.

12.1. Human remains data sets

Cemetery	Date	Size/nature of sample
Giza	4th-5th Dynasty	150 individuals, including 30 sub-adults. Interred in variety of tomb structures, some with titles
Deir el-Bahri	11th Dynasty	Approximately 60 individuals, adult males. Interred in single tomb. Fragmentary remains
Abydos (northern cemetery)	Middle Kingdom	53 burials and numerous fragmentary remains. Varying status burials, interred in tomb shafts, pits, and coffins in sand. Disturbed
Eastern cemetery, Deir el-Medina	18th Dynasty	Non-elite and child burials, succinct from tombs in Western cemetery reserved for higher-ranking workers
Maya shaft, Saqqara	Late New Kingdom - Late Period	550 individuals, including 200 sub-adults. Fragmentary remains
Anubieion, Saqqara	Late Period	Number of sample not known. Well preserved skeletal material in mud coffins
Wadi Halfa, Nubia	Mesolithic - Christian	In excess of 10,000 individuals

12.1.1. *Giza*

The Old Kingdom cemetery is located on the inclination of the Maadi formation to the south west of the settlement at Giza (Chapter 10: 10.3.1.). The cemetery has been provisionally dated to the end of the reign of Khufu, in the 4th Dynasty, through to the 5th Dynasty (c. 2589-c. 2345 BC), although the precise phasing of the cemetery, in relation to the settlement site, remains unconfirmed. Dates have been estimated by the study of iconography, titles, pottery and funerary goods. Tomb biographies developed in the late 4th and early 5th Dynasties with the introduction of personal details (Eyre 1987a: 6; Baines 1999b: 23), and similarities have been noted with reference to the tomb inscriptions at Giza. The limited period of use apparent at the cemetery is beneficial to research, as the duration in occupation directly affects any opportunities for the production of substantial samples with comparable dating (Waldron 1989: 71). The potential for occupation would correspond to a date beyond the peak of activity associated with the construction of the Khufu pyramid and the

second state-planned stage of the settlement, extending beyond the demise of the funerary cult and the abandonment of the site. Significant information may in the future, therefore, be forthcoming regarding the timing of the relocation of the royal burial site and the associated workforce at the end of the reign.

The cemetery demonstrates a variety of tomb structures, ranging from miniature mastabas with false doors and causeways, 'bee-hive' mud brick structures, to small piles of rubble. The former indicates an attempt at replicating the contemporary elite style of funerary architecture, although substantial super-structures accompany humble burial chambers with unsophisticated decorations, suggesting an emphasis upon outward appearances. The mud brick constructions are unusual, and the rubble graves are thought to denote the burials of workers who died during their seasonal attendance (Davies and Friedman 1998: 85-86), or the graves of the socially subordinate assistants. These hypotheses are, however, conjecture at this stage, as excavation has yet to confirm either suggestion. Funerary goods, including statues, and the tomb inscriptions provide valuable information regarding the titles of the deceased and their roles during life (Davies and Friedman 1998: 86-87).

Evidential limitations

The cemetery is undergoing current excavation by Dr. Zahi Hawass, Director of the Giza plateau and his team of Egyptian archaeologists. Published material on the human remains evidence is scarce, and to date, no systematic study has been completed on the evidence for disease in the skeletal material. Specialist publications regarding the human remains have been confined to studies on skeletal sexing (Sarry el-Din and Hawass 1997), vertebral canal dimensions, (Sarry el-Din *et al* 1999), tooth pathology (Sarry el-Din and Hawass 2000) and enamel hypoplasia (Sarry el-Din *et al* 2000). In some cases the publications have included comparisons with a cemetery sample denoted the 'high officials' excavated from the Western mastaba fields.

Subsequent interpretation of the material from the Giza cemetery in this chapter is based upon a combination of personal communications with Dr. Sarry el-Din in March 2001, lectures by Dr. Hawass at the German Institute in Cairo (November 2000) and by associated specialists at the Cairo Egyptological conference in 2000. My personal visits to the cemetery site in November 2000, March 2001 and March

2002 and my limited access to view the human remains data provide the basis for further observations. General publications that include aspects of the excavation (Davies and Friedman 1998; Tyldesley 2000) are used sparingly as they are subject to misrepresentations. This lack of documentation of the evidence is frustrating and will possibly lead to the loss of information, and certainly results in inaccurate speculation in the short term. It can only be hoped that specialist palaeopathology publications will be forthcoming from this extremely important site.

The nature of the sample

The extent and potential population of the cemetery at Giza is unconfirmed, but identified burials are in excess of 600. To date, a sample of 150 individuals has been retrieved, comprising approximately 30 sub-adults, the remainder demonstrating an equal division between adult males and females. If the cemetery is directly associated with the settlement (and dating has not confirmed this), then the occupants comprise a select occupational group together with their followers and assistants. The community was established and maintained as a pyramid town where the prime objective was to complete the royal pyramids. The resulting population was not, therefore, representative of other indigenous communities, being chosen either for their expertise on industrial projects and in providing the support framework for the programme, or as corvéed labour in participation on state projects. Unrepresentative as it may be, the data provides the human remains evidence for specific occupational groups and in this capacity is both significant and important.

The interest in artefact retrieval at Giza imposes an elite bias upon the excavation schedule where the more substantial tombs are targeted first. This goal naturally skews the information, including the human remains evidence, in favour of the more elite workers. The simple sand burials, that could contain the remains of the labourers involved in pyramid construction, or the socially inferior assistants to the administrators, remain unexcavated altogether in favour of the more prestigious tombs, once again demonstrating an archaeological preoccupation with the elite sector of society. In spite of the unrepresentative sample, this cemetery does delineate an unusual example of a Dynastic non-elite site and the human remains provide an opportunity to examine the palaeopathology of selected members of this interesting community.

The admitted purpose of the cemetery excavation has a nationalistic flavour in endeavouring to redress the balance between Egyptian and foreign archaeological discoveries by the retrieval of impressive funerary artefacts. Scientific investigations have prioritised attempts to establish DNA links between the ancient and modern Egyptian populations aiming to disprove in the process historical theories relating to foreign intervention regarding monumental achievements. Despite the questionable ability of DNA to survive in skeletal evidence from ancient Egypt, owing to the heat (Hedges and Sykes 1993: 99), resources have been channelled into the attempt to establish compatibility with contemporary Egyptians. This procedure has taken precedence over any undertaking of detailed palaeopathology investigations.

Tombs are being evacuated with little attempt at recording the position or possible significance of the contents. Each burial is valued for its funerary equipment and potential in upholding the misguided research questions. Limited efforts at scientific study of the human remains are being undertaken, restricted by the lack of equipment and expertise. The sample of human remains at Giza comprises the skeletal material excavated from approximately 150 of the more conspicuous and elaborate tomb structures. Although denoted 'workers' by the excavators, these tombs clearly accommodated the administrative class, as opposed to the manual labour force, as demonstrated by the time and resources required in constructing the tombs. An appreciation of the identity, in addition to individual and environmental conditions applicable to the corvéed workers, is crucial to the understanding of the logistical and humanitarian aspects associated with state projects. No attempt is being made to identify a possible site for their burials, or to excavate the less elite inhumations that have been enumerated amongst the more elaborate tombs. It remains unlikely that even the skeletal evidence relating to the administrators will be examined and interpreted in terms of individual, social and environmental significance.

A sample of 80 individuals from the cemetery has been examined for dental pathology. Although few caries were noted, a high prevalence of abscessing as a result of attrition was observed (Sarry el-Din and Hawass 2000: 1540), consistent with the high levels of starch and abrasive material in the ancient diet. Enamel hypoplasia was a common feature indicating dietary insufficiencies during childhood. Preliminary examination of the sample has revealed a high prevalence of

osteoarthritis of the cervical thoracic and lumbar regions, which together with the presence of Schmorl's nodes in younger individuals suggest a degree of functional stress. Fractures have been noted and two cases of limb amputation have been identified, the significance of which will be discussed in more detail below (12.4.)

12.1.2. *Deir el-Bahri: the slain soldiers of Neb-ḥetep-Re*

The slain soldiers of Neb-ḥetep-Re comprise a collection of some sixty individuals (precise numbers are not known due to their dismembered state), interred around 2060BC in a single tomb at Deir el-Bahri. The precise dating of the material remains a subject of discussion (Vogel 2003: 243-244). Tomb pillaging has removed any traces of funerary artefacts had they been present, and has contributed to the fragmentary state of the human remains. Excavated in the 1920s, Winlock (1945: 7) identified 59 skulls and 52 right femurs, but was confident in only 10 cases that individuals could be reassembled accurately. The human remains data is informative about a range of tissue and skeletal injuries inflicted during battle (detailed in table 6; Appendix 1), but only within the parameters of evidential survival. In many cases the nature of the implement is also apparent where, for example, arrows remain present. This particular conflict has been denoted an internal one, a conclusion based upon the weapons used (Winlock 1945: 24).

Unfortunately little information can be derived regarding the more general health of the individuals due to the lack of investigative procedures carried out at the time of excavation. It was noted that individual stature was above average (although comparisons are few) and exceeded that of data from the Predynastic and that of Egyptians in the 1920s. This observation has led to the conclusion that the individuals demonstrated nutritional superiority (Winlock 1945: 7), but it is more likely to reflect the selection procedure for the soldiery, where a preference for the fit, tall and strong would bias the sample (Winlock 1945: 8). In keeping with the interest of the time, craniometry studies were implemented to ascertain racial origins. In light of the results assumptions were made that these soldiers originated from Upper Egypt (Winlock 1945: 7-8). Dental examination noted that teeth were worn but contained a low prevalence of caries, and the anticipated age range of 30-40 years for the individuals was based on these observations (Winlock 1945: 8-9). Ideally the sample

requires re-examination and analysis to establish these earlier hypotheses (Vogel 2003: 244).

12.1.3. *Abydos*

Excavations at the northern cemetery at Abydos have revealed a collection of inhumations, a number of which have been analysed in detail and date to the Middle Kingdom (Baker 1997: 110). Nutritional deficiencies, particularly in iron, are apparent throughout all the socio-economic groups represented in the sample, if porotic hyperostosis is accepted as a reliable determinant. Dental health was poor, indicating childhood malnutrition due to dietary deficiencies and/or infection, and the insufficient diet was reflected in the adult stature of the individuals. Caries and abscesses were widespread and severe amongst older individuals, indicative of the abundance of diet and grit in the ancient Egyptian diet. Schmorl's nodes were prevalent amongst the individuals and, when occurring in young adults in the sample, provides an indication of stress on the vertebral joints from the habitual carrying of heavy loads (Baker 1997: 111). Osteoarthritis of the lumbar and cervical regions in older members of the sample could be age or trauma related; cervical degeneration is particularly associated with resting items on the head during transportation (Baker 1997: 111). Further evidence of trauma has been noted from the evidence for healed fractures and one case of repeated trauma and possible murder has been identified in a female member of the sample (Baker 1997: 111). Infection was uniform throughout the sample, although in many cases the type of infection remains obscure, although respiratory tract infections (possible cryptococcosis) in three cases and tuberculosis in a further two cases have been postulated (Baker 1997: 112).

12.1.4. *Eastern cemetery, Deir el-Medina*

The cemetery evidence from Deir el-Medina during the 18th Dynasty indicates a social division where higher-ranking workers were interred in the Western cemetery and their relatives and members of the less-elite workforce were buried in the Eastern cemetery (Meskell 1999: 148). Individual status was paramount in determining burial location where diversity between family members is apparent (Meskell 1999: 146). During the subsequent dynasties, burials were concentrated solely in the Western cemetery (Meskell 2002: 198), where communal structures eliminated the necessity for 'poor' interments (Meskell 1999: 147). The location of individual burials in the

Eastern cemetery was determined by age and sex, where infants occupied the base of the incline, adolescents the middle and shaft graves with adult groups or individuals were located towards the top (Meskell 1994: 201).

For the purposes of this chapter the 400 'non-elite' burials identified in the Eastern cemetery at Gournet Murai provide the basis for discussion, as they are informative regarding funerary provision for these strata of society. The burials demonstrate varying states of preservation, reuse and disturbance and contained a surprising quantity of artefacts despite the 'poverty' demonstrated by the nature of the interments themselves. The complexity in funerary artefacts has facilitated various statistical studies based upon their assemblages (Meskell 1999: 137-138). The human remains data demonstrates a predominance of females and children, prompting the assumption that the male sector of society was buried elsewhere (Meskell 1999: 166). Future detailed studies in palaeopathology are required to assess the health of the individuals during life. Similar to the evidence from Giza (12.1.1.), the human remains evidence from the Eastern cemetery at Deir el-Medina represents a distinct occupational group. The evidence for congenital abnormalities, in the form of possible dwarfism and scoliosis has been tentatively identified from the remains of two child burials, their survival beyond birth indicating a supportive family structure (Meskell 1999: 171).

12.1.5. *Maya shaft, Saqqara*

Dating to the late New Kingdom and Late period, the human remains of 550 individuals, including 350 adults, have been excavated and documented from the tomb shaft of Maya at Saqqara (Strouhal 1995). The skeletal material had been disturbed, so analysis has been based upon anatomical observation as opposed to pathology of the individual.

Initial examination of the remains has revealed a range of anomalies, including a high prevalence of congenital abnormalities, including metopism and spondylolisthesis (Strouhal 1995: 12-13), although the fragmentary nature of the evidence prevents any attempt to hypothesise about actual figures. A majority of adults within the sample demonstrate indications of degenerative-productive disease, where individuals over 30 years of age exhibit osteophytosis of the spine. Also present were non-

inflammatory arthritis and joint degeneration both indicative of hard labour during life. Strouhal (1995: 12) identifies the social classification of the sample by means of their degenerative disorders based upon the assumption that the non-elite would display these symptoms in greater prevalence than the elite sectors of society.

Limited evidence for injuries has been noted, but inflammatory conditions were common, including mastoiditis and osteomyelitis (possibly tuberculosis related). Malignant tumours were also prevalent, where one individual in particular demonstrates a sizeable cranial tumour, the symptoms of which would have been debilitating (Strouhal 1995: 13).

Future studies including metabolic, dental and endocrinological research are expected to reveal further details of the unhealthy status of the sample.

12.1.6. *Anubieion, Saqqara*

A Late Period cemetery has been excavated and documented revealing 116 well-preserved skeletons and additional collections of fragmentary material (Giddy *et al* 1992: 43-4). A detailed catalogue has been compiled listing the state of preservation, evidence for partial mummification, body position, coffin decoration and artefactual recovery (Giddy *et al* 1992: 45-85), but further skeletal analysis in terms of the identification of pathology has yet to be forthcoming. Unfortunately, without even preliminary observations on the skeletal material, it is not possible to comment on any aspect of the health of the individuals excavated. Until pathological reports become available, the only significance of this sample to this thesis is its provisional classification as a non-elite cemetery (Giddy *et al* 1992: 88). Without the endorsement of comparative data, the relative poverty of the funerary arrangements, in terms of standard of coffin and lack of inscriptions, have been used as a determining factor. However 'poor' the interments are in relative terms, they certainly belong to the non-elite strata of society, in which capacity they provide an indication of the comprehensive nature of artefactual inclusions, in terms of amulets and ceramics. More usually associated with prestigious burials, the artefactual evidence provides potential comparable data for the burials in the Eastern Cemetery at Deir el-Medina (above: 12.1.4.), often thought to reflect a more privileged

community. The excavation of further non-elite cemeteries may reveal the inclusion of funerary goods as a standard even for the non-elite in society.

12.1.7. *Nubia*

Substantial excavations took place in Nubia to retrieve information from the areas to be flooded subsequent to the construction of the Aswan dam. The first phase of excavation, from 1907-11, tackled 151 cemeteries and 8,238 graves (Elliot Smith and Wood Jones 1910). A subsequent expedition, from 1929-34, concentrated on the meticulous survey of a further 2,382 burials (Emery 1965). Skeletal material was recorded but only crania and 'interesting' pathology was retrieved and retained. General observations were made, including age, sex, long bone measurements and pathology, but the focus of research was concerned with craniometric and racial studies (Batrawi 1945; 1946). The data contributes, however, comprehensively to our understanding of non-elite health over a considerable time period, especially as a result of more recent investigations of the material (Baker 1997).

In summary, the data from Nubia indicates a general picture of high infant mortality and low life expectancy. Fluctuations throughout time are attributed to living conditions, nutritional standards and parasite infestation (Baker 1997: 109), all indicative in turn of the wider political and environmental picture. Noted at the time of excavation (Wood Jones 1908) was a high prevalence of fractured forearms and clavicles attributed to stick blows. Additional fractures were recorded showing various states of realignment (Nunn 1996: 177).

12.2. Human remains evidence, nutritional status and health

High infant mortality rates and low life expectancy are key factors in a community challenged by inadequate nutrition, infection and parasite infestation. The human remains evidence from Giza, Abydos, Deir el-Medina and Nubia all support the hypothesis that the health of the ancient Egyptians was severely compromised for a variety of nutritional and social reasons. Various skeletal and dental lesions act as indicators of nutritional status and stress. For instance, overall height is affected by dietary intake (Waldron 1989: 62), although results can be misleading, as skeletal measurements are often unreliable due to incomplete evidence and the bias of the sample (as demonstrated by, for example, the analysis of the soldiers of Neb-ḥetep-Re

(above 12.1.2.)). *Cribra orbitalia* is considered by some to be associated with iron deficiency anaemia due to malnutrition and/or parasite infestation (Scheidel 2001: 139). In addition, enamel hypoplasia provides a record of childhood nutritional and disease-induced stresses (Cohen 1989: 110), the study of which can facilitate the precise timing of enamel formation interruptions (Hillson 1993: 84). The accuracy of interpretations is directly related to the nature of the sample. Insufficient sample sizes, the social stratification of the cemetery and its urban or rural location can all affect the extrapolation of data (Rose *et al* 1993: 61). Variations between, for example, the prevalence of dental caries in contemporary cemeteries can be distinct (Hillson 1979: 160), due to social and dietary variants, rendering applications to the wider community hazardous. Comparisons between cemetery populations require standardised recording procedures that are unfortunately frequently omitted (Rose *et al* 1993: 69).

Standardised procedures have been applied to aspects of dental pathology within a sample of 80 individuals from the 'workers'' cemetery at Giza (Sarry el-Din and Hawass 2000). Limited evidence for caries was recognised, whereas the high prevalence of abscessing resulting from attrition, caused by the high levels of grit in the diet (Leek 1986b: 42), was manifest (Sarry el-Din and Hawass 2000: 1540). This is in keeping with the observations on loaf residues that have identified the inclusion of abrasive material, although samples originate from tomb contexts and may not represent the standard recipe (Samuel 2000: 542; 565). The presence of caries is indicative of a high consumption of sugar combined with a low intake of meat (Hillson 1979: 156). The high protein diet surmised from the faunal remains at Giza may have been instrumental in reducing the number of caries within the sample (Redding 2000). Certainly comparable samples, for example at Abydos, indicate a higher prevalence of caries than the sample at Giza.

Also significant are the enamel hypoplasia studies that have concluded a higher prevalence of enamel inconsistencies amongst the 'workers' when compared to the 'high officials' from the Western cemetery, attributed to social, dietary and occupational differentiation (Sarry el-Din *et al* 2000: 1877-1878). As the 'workers' constitute the administrative classes involved in the organisation of and provisioning for the state construction project, it would be expected that their social advantage in

childhood would minimise differentials between the two samples. It is possible that the supervisory positions were filled from the lower social ranks where nutritional deficiencies, particularly an insufficient protein intake, potentially impacted upon the immune system and the ability to resist infectious diseases. Conversely, the dietary information obtained from the settlement site at Giza suggests a high consumption of fish and meat (Redding 2000). It is not clear, however, as to whether this diet was available for the entire workforce, but it would be expected that the socially elevated administrators would have been partaking. In keeping with the temporary nature of the corvéed labour force on state projects, the comprehensive diet indicated by archaeological and archaeobotanical remains at Giza represents at best a nutritious interval in individual consumption. The more permanent nature of employment for the administrators, indicated by their tomb structures and presence of family members in the cemetery population, would suggest a more long-standing benefit to dietary content. Certainly children born into the community would enjoy an improved quality in nutrition, if hypotheses from the settlement at Giza are correct. This is not borne out by the human remains evidence that indicates a peak in enamel hypoplasia between the ages of 2 and 4 years that has been attributed to the transitional period between weaning and its replacement with an inadequate diet (Sarry el-Din *et al* 2000: 1878).

Further nutritional stresses have been identified through the study of vertebral canal dimensions and *cribra orbitalia*, although there is no conclusive evidence that either condition is indicative of malnutrition and anaemia (Waldron pers comm). Even if the analysis were useful, the samples from the 'high officials' and 'workers' have been amalgamated, eliminating the potential for comparisons (Sarry el-Din *et al* 1999: 214). Perhaps more conclusive is the assessment of parietal thickening, which, if symptomatic of anaemia, suggests parasitic infestation in addition to nutritional deficiencies. The human remains evidence from the Nubian sample indicates that parasite infestation was prevalent and judging from specific parasite studies, it would be expected that the prevalence of infestation throughout ancient Egypt would be high (David and Archbold 2000: 95: 107). This would apply particularly to the agricultural workers corvéed for manual labour, but of course there is no human remains evidence to substantiate this. The administrators, partaking of a shared water source, would also be subject to parasite infestation. The opportunity for confirmation of this

hypothesis, in the form of soil analysis from within the burial, has unfortunately been missed.

12.3. *Human remains and work-related health issues*

The appreciation of work-related diseases and injuries is an important factor in the broader understanding of the health of the workforces, as it is likely that the tasks that determined their roles during life also influenced their environment and contributed to activity related pressures. Only a fraction of diseases and conditions result in residual and identifiable traces in the human remains evidence, a situation that, in part, accounts for the under-representation of abnormalities in the archaeological record. By implication, the potential for the identification of work-related health issues is further restricted. The range of activity-related indicators include: the evidence for fractures and skeletal changes, and soft tissue damage due to exposure to dangerous substances, for example, the relationship between silicosis in lung tissue and the task of stone cutting (Waldron 1989: 68). Table 5 catalogues a range of occupations and their anticipated attendant health hazards. The identification of the physical representation of these hazards from the human remains is fraught with bias and complications, a situation discussed more fully in chapter 16. The unique status of the sample of slain soldiers (above 12.1.2. Table: 6. Appendix: 1) provides the only positive evidence of occupation-related injury amongst the various sets of human remains data.

Craft specialisation in ancient Egypt resulted in a community with occupationally defined roles. The repetitive actions and postures inherent in the performance of tasks, indicated by textual, artistic and archaeological sources, can be evaluated and contrasted. It might be expected that abnormalities and changes in the human remains would confirm the negative affects of craft specialisation and manually demanding occupations. However, it is important to appreciate that despite numerous discussions and examples of conclusion jumping (for example: Tyldesley 2000: 157), unfortunately skeletal changes in the form of osteoarthritis cannot denote a specific occupation on the part of the deceased (Waldron 1989: 67; 1994: 92-99). Even where disease patterns have been studied in live patients with known occupations, no exclusive relationship can be established as to the characterisation of skeletal stress in association with a particular task, resulting in a difficulty in creating references

against which to compare the ancient data (Waldron 1989: 67). This is not to deny that some correlations have been observed, for example, labourers demonstrating knee modifications and stone workers with wrist and elbow pathology, but the symptoms are neither exclusive nor consistent (Waldron 1994: 94-95). Non-occupational factors that predispose to osteoarthritic changes include genetic, sex, weight and ethnicity factors (Waldron 1994: 93). Although not indicating a specific occupation, osteoarthritic joint changes and entheses can be informative in the general identification of anatomical areas under stress and the likely causes (Waldron 1989: 67). The occurrence of osteoarthritis amongst younger samples will more likely reflect activity-related causative factors (Roberts and Manchester 1995: 109), where repetitive actions or habitual postures have been adopted at an early age and continued into adulthood. The human remains data from Abydos indicates a high prevalence of osteoarthritic changes and Schmorl's nodes suggesting weight-carrying activities throughout life. Whether these activities were occupation related or as a result of domestic demands is impossible to substantiate.

Preliminary observations of the skeletal material at Giza have revealed a high prevalence of degenerative joint diseases in both males and females, and, although the cases are non-representative and causative factors cannot be established, the suggestion remains that joint stress was a factor during life. In addition, osteoarthritis has been identified in cervical, thoracic and lumbar spinal regions. The occurrence of these pathological changes in material estimated to be less than 40 years old suggests conditions symptomatic of functional stress. Osteophytosis, spinal compression and Schmorl's nodes have also been identified as being particularly apparent within the Giza sample, especially when compared to a set of data from an 'officials' cemetery of similar age and date. Cervical vertebral compression has been identified in a 30-35 year old female, suggesting a stress-induced condition possibly relating to the carrying of weights on the head. The evidence from the human remains at both Abydos and the Maya shaft at Saqqara indicates the skeletal changes contiguous with habitual carrying and manual labour. A high prevalence of joint disease within a sample can confuse any possible distinctions between the various activity-related causative factors (Waldron 1989: 68). For example, Satinoff (1973a: 210-212) has examined 300 skeletons from ancient Egypt, and has identified squatting facets in 96% of cases. If acquired during life, as opposed to being genetically inherited, the

symmetrical distribution suggests habitual squatting, as depicted in association with many crafts and industries, but it fails to assist with the distinction between the activities.

No quantitative studies have taken place using the Giza data, and the limited size of the sample negates extrapolations to the wider community. Without the completion of systematic studies, conclusions are restricted to observations that members of the community at Giza (although it is unclear as to which ones specifically) were probably involved in lifting and carrying weights from an early age. These circumstances resulted in degenerative conditions of the joints in adult life. No conjectures can be attempted about how the role of the individual affected their health until the skeletal material has been related to the archaeological material in terms of prosopography, and the remains have been analysed fully.

The combination of tomb inscriptions and the human remains evidence from the cemetery at Giza provide an unusual opportunity to analyse comparatively the data from occupationally identifiable individuals. The skeletons are being excavated from provenanced tombs with autobiographical texts referring to the occupant's role during life. It is of course hazardous to hypothesise about the exact meaning of titles in an ancient context and the nature of the activities involved within a specific occupation. The artistic representations of tasks in progress assist in forming conjectures about potential habitual postures and movements associated with particular tasks (Chapter 9). Although the funerary context of these representations introduces a bias associated with religious and ideological ideals, the necessity for adequate provisioning in the Afterlife resulted in occupational processes being included in the repertoire of scenes. Their technical inclusiveness was necessary for the successful continuation of production, and technological details have been confirmed by artefactual and archaeological recovery in industrial settings (for example: Chapter 11). The postures adopted by the workers in the artistic representations frequently reflect ethnographic information for the same occupational procedure. The combination of textual, artistic and archaeological sources of evidence substantiates a number of hypotheses concerning the method in which certain trades were performed. Without detailed palaeopathology studies on the remains from Giza an invaluable

opportunity to complete the evidential picture for this particular working community is lost.

Although there are inherent dangers associated with attaching preconceived occupation-related pathology to skeletal changes (Waldron 1987: 67), it remains a valuable exercise to examine apparent stress indicators and to evaluate their potential in relation to the activities carried out by the individual. In keeping with the excavation tradition that handles each burial as an isolated case, removed from its immediate or broader environment (Giddy 1999a: 111), no attempt is being made amongst the physical anthropologists at Giza to examine the remains within their context. The skeletal evidence has not been evaluated in relation to specific individual roles during life, nor has an assessment of the comparative socio-economic implications of the various industries demonstrated by the style of burial, funerary goods and nutritional status been attempted. Any future examination of the evidence will be impeded by the inadequate storage facilities afforded to the remains, which has resulted in disarticulation and confusion, a situation noted by Leek (1986a: 185) with reference to the Western cemetery excavation at Giza and unfortunately unimproved today.

12.4. *Human remains and the evidence for medical intervention*

Medical intervention suggests a response on the part of the individual or society to the challenges posed by the hazards of everyday existence. Recurrent or widespread issues would prompt concerted efforts of which the medical papyri provide a prime example. It would be significant to establish from the human remains evidence as to whether the non-elite workforces were recipients of any medical intervention. If they were, this would support the theory that the Edwin Smith papyrus was a manual of occupational or military trauma (Chapter 5: 5.1.), in addition to indicating the wider cultural implications for a community that recognised and treated occupation-related issues (Chapter 1: 1.3.).

There is no archaeological evidence to date, from Giza or any other settlement site, for the existence of centres devoted to the handling of the sick in Dynastic Egypt. The medical papyri do not mention the location advised for the recuperation of the diseased or injured. The assumption, based on textual evidence from the New

Kingdom site of Deir el-Medina (Janssen 1980: 136), is that the sick were catered for in their home environment. How this situation relates to earlier periods or other communities is unclear. The cemetery population at Giza indicates that family members were included within the living population at administrator level, possibly fulfilling a supportive role. It seems unlikely that the corvéed workforce would have enjoyed a similar arrangement.

The medical texts themselves confirm that health issues and the efforts to control and treat diseases and injuries were important considerations. Brothwell (1972: 355) hypothesises that the devastating effects of infectious diseases in early urban communities led to the development of medicine as a practice distinct from the tradition of witchcraft. The evidence from Abydos, for example, indicates that infection was uniform. Although it is not possible to accurately predict the patterns of diseases in an ancient context, or to compare their impact to historical or modern situations (Scheidel 2001: 113-114), chronic infection in addition to parasite infestation was likely to have had debilitating affects on the ancient community. It can only be hypothesised that, in particular, infectious diseases would have devastated ancient communities with differing environmental and resistance determinants. Egypt has been exposed to epidemics throughout its history (Gallagher 1990; Colley 1996; Watts 1997: 25-40), and the seasonal introduction of a large labour force at Giza would potentially predispose the community to outbreaks of infectious diseases. Cholera outbreaks in 19th century Egypt resulted in the prioritisation of public health issues (Kuhnke 1990: 49). The Egyptian method of contagion control at this time consisted of barricading the infected person together with their relatives into their own homes, thus virtually guaranteeing the demise of the entire family. The notion of isolating the sick away from the healthy had not yet been appreciated (Gallagher 1990: 120). Different societies demonstrate distinct methods of contagion control: Brothwell (1972: 356) suggests that the Mesopotamians were isolating their sick 3,500 years ago. Filer (1995: 73) observes that sufferers from infectious diseases, particularly leprosy, in ancient Egypt faced exile from the community, although the evidence for this is uncertain both in terms of identifying the disease and in establishing evidence for isolation. The management of large numbers of sick and dead, afflicted during an epidemic, encourages the organisation of resources specifically for this purpose (Brothwell 1972: 356). The evidence for the emergence

of a specialist class of physician in the Old Kingdom (Nunn 1996: 116-117) could have been a factor in a larger system of health care. The legend of Imhotep links the doctor's role with that of the architect of the 3rd Dynasty step pyramid at Saqqara (Nunn 1996: 122). It is interesting that medical expertise and building projects were associated together in the ancient Egyptian mind (Kemp 1989: 106), a factor, albeit difficult to substantiate, suggesting that the two occupations were linked through the management and requirements of the enterprise and workforce. Limited textual evidence refers to the inclusion of physicians on specific expeditions (Gardiner *et al* 1952-55: 94; 121), but no comparative evidence is available for state building projects. It is possible that the logistical hazards, imposed by the prevalence of diseases and injuries on state building enterprises, provided a catalyst for the development of a medical practice and gave rise to the subsequent association between the two professions. The composition of the Edwin Smith papyrus and its 'scientific' content has been associated with the management requirement of an increased frequency of injuries in battle or occupational settings (Chapter 5.). It would certainly be expected that the high level of injuries associated with labour-intensive tasks would have prompted the development and specialisation of treatment methods.

It might be considered that the successful realignment of fractures was directly indicative of medical intervention in the form of reduction and immobilisation of the affected bone. The human remains evidence from Giza has been interpreted as confirmation that both workers and officials benefited from medical intervention for their injuries (Hussein *et al* 2000: 88). 170 skeletons from the Western cemetery for 'high officials' at Giza were compared with 76 skeletons from the 'workers'' cemetery comprising overseers and their families (Hussein lecture: 31/03 2000). Fractures were more frequent amongst the second group, but realignment of the broken bones was noted in both assemblages. My personal examination of the fractures from the 'workers'' cemetery confirms that the basis for assuming the presence of medical intervention was spurious. All cases were confined to instances where the radius was fractured but the ulna remained undamaged, or where the fibula was fractured but the tibia remained intact. Under these circumstances, natural splinting of the damaged bone by the undamaged bone would minimise muscle override and maintain correct alignment without any medical intervention. The

proposed intervention is a misleading assumption, as not only does it suggest an unsubstantiated medical understanding, but it also infers a social comment on the democratic nature of medical provision for the, albeit wrongly identified, unskilled labour force.

Medical intervention for fractures, in the form of reduction, is required to avoid displacement and limb shortening. The inclusion of splints in 5th Dynasty burials (2494-2345 BC) at *Naga ed-Dêr* (Elliot Smith 1908: 6; Elliot Smith and Dawson 1924: 161), and the reference to splinting in the Edwin Smith papyrus (Breasted 1930: 54-55) substantiates the evidence for use during and subsequent to the Old Kingdom. The application of a splint is, however, useless without successful reduction, traction and immobilisation, and evidence as to how this was achieved is lacking (Nunn 1996: 177). Schultz (1967: 50-51) has questioned the role of medical intervention in the management of fractures when he observed healed fractures with correct alignment in wild primates, suggesting that this could be achieved without assistance. Success does, however, depend upon which bones were involved and their associated degree of muscle override. Satinoff (1973b: 251), in his study of traumatic lesions in the human remains evidence from Aswan, Abydos and Gebelein, concludes that without anaesthetic, reduction would have been impractical. Although difficult, it is possible with restraint and assistance from, for example an opiate or more recently alcohol, explaining the evidence for some degree of intervention with the majority of fractures in the archaeological record (Waldron pers comm). The incidence of displacement amongst the sample in Satinoff's study (1973b) demonstrates that although splints were used to immobilise, realignment was frequently not achieved. The evidence for fractures in the Abydos and Nubian samples indicates a varying degree of success in the correct realignment of the fractured bones. In particular, an example of a fractured femur from the Nubian data illustrates such accurate realignment despite the problems associated with muscle over-ride, that the system of traction represents the feasible treatment (Nunn 1996: 177). Additional less successful examples suggest that medical intervention was not uniformly available and/or fortuitous.

The human remains evidence from Giza illustrates two cases where limb amputation was survived for a number of years. It is not possible to determine whether the amputations were a direct result of a traumatic injury, or whether a surgical procedure

had been initiated to treat a mutilated limb. It is interesting that individuals could survive not only the initial trauma of such incidents, where blood loss and infection would have been potentially fatal, but that society was capable of supporting maimed individuals during their subsequently incapacitated lives. An individual from the Maya tomb shaft at Saqqara suffered a cranial lesion that would have required support for the debilitating symptoms (Strouhal 1995: 13). Likewise the evidence from additional individuals from Saqqara and Deir el-Medina indicate that congenital abnormalities were a cause for concern (Strouhal 1995: 12-13; Meskell 1999: 177). The soldiers from Deir el-Bahri provide indications of healed cranial wounds where the associated incapacity and risk of infection can only be surmised (Table 6: Appendix 1). These isolated examples suggest a degree of medical and social care for these members of the administration class. Whether this situation applied to the greater prevalence of injuries expected amongst the corvéed labour force cannot be confirmed. Excavations from the 'workers'' cemetery at Giza have revealed examples of both dwarfism and skeletal trauma that would have resulted in deformity. It is tempting to draw inferences about community cohesion and a positive attitude towards disability from these few examples, but, as the evidence is insufficient to make confident claims, conclusions must be cautious. The population at Giza, in particular, was unusual in its purposeful accumulation for the construction of the pyramids, and it might be expected that, once physical capabilities were impaired, the individual would be deemed redundant and obliged to return to their original community.

To summarise, the limited samples of non-elite human remains indicate a prevalence of nutritional deficiencies, diseases and injuries. Infection and parasite infestation was rife, determining the high infant mortality rates demonstrated at Deir el-Medina and in Nubia, and incapacitating individuals of all ages. Fractures, particularly within the Nubian sample, were prevalent and the evidence for medical intervention is convincing yet inconsistent in its application and success. Without further examination of existing samples, the publishing of excavated data (a palaeopathological report on the human remains from the Anubieion sample is hopefully forthcoming), or the excavation of additional non-elite cemeteries, the information to be gleaned is naturally fragmentary.

Section Two

Evaluation of the sources in the light of the evidential biases

Introduction

In researching the subject of non-elite health amongst workforces in ancient Egypt, the under-representation of this social group within the ancient record became increasingly apparent. The complexities of both the ancient and subsequent biases have contrived to exclude the non-elite wherever possible. The compilation of information and subsequent interpretation is reliant upon an understanding of the social and cultural issues that contrived to mask the true position of the non-elite within ancient Egypt.

The survival of the evidence has directly influenced our ability to reconstruct aspects of ancient life, where injuries and diseases in particular are, for a variety of reasons, grossly under-represented within the human remains record. Subsequent excavation and professional priorities have been focused upon elite activities and, although the academic climate is undergoing a gradual change in direction to encompass the broader aspects of society, an incalculable loss of information has already occurred.

It is the interplay between the ancient and modern factors disguising the fate of the non-elite in ancient Egypt that renders the reasons for the lack of evidence almost as interesting as the evidence itself. Consequently this section is devoted to exploring in a systematic way the evidential biases that affect our ability to access information regarding non-elite health issues.

Chapter 13

Biases in the documentary sources and their affect upon our ability to access information regarding the health of non-elite workforces

13.1. Excavation biases

The traditional focus of Egyptology upon monumental architecture, comprising temples and tombs, has resulted in the identification of the majority of texts and inscriptions from within the context of these elite structures. These 'formal' inscriptions relate to political, ideological and religious issues and conform to strict conventions regarding presentation and subject matter. More diverse texts, including technical and literary documents have been retrieved from funerary locations (Parkinson 1991: 22) and are thought to represent the tomb owner's private collection for beneficial purposes in the Afterlife. Their selection is likely to relate to personal choice and symbolic assistance after death, and the extent to which the medical texts, in particular, were concerned with the health of the general population has been discussed above (Chapter 5).

Papyri have been retrieved from settlement contexts including Lahun, Amarna and Deir el-Medina, raising expectations that they may pertain to non-elite issues. Certainly administrative texts (Janssen 1980; Quirke 1990) and the example of a medical treatise (Von Deines *et al* 1958a) provide an insight into the organisation and concerns of the particular societies. All three settlements comprise examples of state-planned arrangements associated with royal funerary complexes and a temporary 'capital' and administrative settlement. Extrapolations to the wider community must be cautious as the characteristics of the texts were likely to reflect the elite function of the site, inspired by economic or religious factors, as opposed to comprising a representative example of settlements in general. The majority of settlements in ancient Egypt would be expected to demonstrate aspects of 'organic' growth patterns, housing a cross-section of the population in terms of age distribution and occupation, defining characteristics of sites that are so under-represented in the archaeological record (Chapter 15). Until a representative sample of settlement sites has been identified and excavated it is impossible to ascertain the extent of bias imposed by

non-elite literacy issues, elite prerogatives and consequently the limitations of the existing sources.

13.2. Evidential survival

The documentary record adopted a variety of media for expression including; stone inscriptions, stelae and ostraca; painted and inscribed texts in a funerary context, and papyrus documents. The sources pertaining to this thesis include the rock inscriptions and stelae detailing mining and quarrying expeditions (Chapter 2), and the papyri comprising administrative and literary texts and medical treatises (Chapters 4; 5).

13.2.1. *Rock inscriptions, stelae and their survival*

Graffiti and inscriptions relating to the dates of expeditions, their personnel and organisational details have been preserved at quarrying and mining sites throughout the pharaonic period (Chapter 2). Although excavations of specific sites and the translation of inscriptions relating to these industries has received attention in the past (for example: Engelbach 1933: 1938; Gardiner *et al* 1952-55), it is only recently that Egyptology has begun to appreciate the broader implications of raw material procurement. These factors include aspects of state ideology, economical issues, organisation of resources and the consequent administrative concerns (for example: Harrell 1989; Shaw 1998; Chapter 17). Fortunately, the remote desert locations of the mines and quarries, principally in the eastern desert and Nubia have, to an extent, favoured the survival of this documentary evidence, although it is impossible to assess the proportion of information that has been forfeited due to post-pharaonic exploitation of the same sites. Stelae have frequently been removed from their placement site and transferred to museum environments, a procedure detrimental to contextual information, but potentially beneficial in terms of preservation. Gardiner *et al* (1952-55: 40) describe how stelae at Serabit el-Khadim were subject to such intense wind and sand erosion that many had worn through, fractured and shattered. Removal from the site constituted the favoured option in terms of protective and conservative solutions for the remaining inscriptions.

13.2.2. *Papyri and their survival*

The preservation of papyri is dependent upon environmental conditions, most specifically aridity, and the detrimental hazards of insect activity and fire. The

desiccation characteristic of desert locations distant from the Nile valley, provide favourable circumstances for survival. As settlements were concentrated in the Nile valley cultivation areas, an incalculable quantity of textual information may have been lost due to post-depositional transformation processes. Many of the sites remain unidentified and unexcavated (Chapter 15) contributing to an imbalance in both settlement and documentary data. Conversely, funerary contexts, in the form of pyramids, tombs and associated construction-related settlements, situated above the cultivation, provided advantageous conditions for the survival of papyri, further biasing the record in favour of literary collections with elite funerary and religious associations.

The destruction of archives during periods of decentralisation (Redford 2001: 105) contributed to the unrepresentative nature of the surviving documentary data in an historical context. More recent activities have been damaging due to lack of attention to the placement or discard location, either due to inadequate excavation supervision as at, for example, Lahun (Luft 1998: 2-3), or due to tomb-robbery practices, resulting in unprovenanced texts surfacing on the antiquities market. The Edwin Smith papyrus constitutes a prime example of these destructive processes where its tomb context remains unsubstantiated and the removal of outer layers to improve saleable quality should, but for a coincidence, have resulted in loss of valuable information (Breasted 1930: 20). For a greater appreciation both of the purpose of the text and in terms of the potential audience, identification of the original context is vital.

13.3. Documentary interpretation

There are numerous interpretative biases and errors inherent in the translation and appreciation of ancient Egyptian texts. The issues are complex and all that can be attempted here is a very brief summary of the key concepts. Possibly most significant is the frequent impossibility providing a mechanical translation, without the introduction of some degree of interpretation, as words and phrases possessed different meanings in varying contexts. The philologist is often required to formulate opinions where the context remains unknown. This subjective interpretation introduces scope for substantial errors, as the choice of a single explanation can be simply inaccurate, or misleading in its exclusion of alternative versions. There is a danger in providing perfunctory explanations for individual words, as the phrase and

grouping is lost in addition to the wider context of compositional purpose (Quirke 1998: viii). Inaccuracies are then perpetuated when established lexicography is applied to other texts. A specific example includes the reference to 'casualties' on an expedition to the Wadi Hammamat where previous studies have favoured an interpretation of fatalities at the expense of alternative explanations (Chapter 2: 2.3.). Furthermore, the ancient texts often presuppose a specific knowledge of context, subjects and people that have certainly been lost during the intervening lapse of time (Frandsen 1992: 31).

Documentary evidence presents the philologist with the task of interpreting concepts that possibly have no parallel in contemporary society. This is particularly relevant to the study of religious and medical/magical data where a word-for-word translation is frequently either not possible, or results in a culturally specific and incomprehensible translation. The temptation to apply cross-cultural interpretations projects the translator's views and cultural environment onto the texts (Finnestad 1989a: 35), where a dichotomy between accuracy in translation and readability in a modern context is a constant balance that requires consideration (Nordh 1996: 14).

More specifically, direct translations are lacking for numerous words in the medical texts, severely hampering attempts at identifying symptoms, diseases and methods of treatment (Chapter 5). Specific words are unique to the papyri and without the facility for cross-referencing elucidation remains impossible. A striking example is provided by the confusion surrounding the translation of the frequent reference to the term *mt* (Nunn 1996: 44-49). Misunderstandings have been perpetuated by the appearance of the same terminology to convey a range of tissues and systems including blood vessels, tendons and muscles (Walker 1996: 236-240). Philologists are denied a succinct translation because the term applies to what we perceive to comprise a range of categories and resist the possibility that the term could possibly apply to all. We prefer to categorise anatomy and physiology by 'functional systems' (Walker 1996: 259), and allocate separate words to denote vessels and tissues with different functions. The textual evidence suggests that by comparison regional divisions held greater significance for the ancient Egyptians, a concept clearly illustrated by the organisation of cases in the Edwin Smith papyrus (Chapter 5: 5.1.; 5.2.), and indicative of the natural avoidance of functional definitions where

understanding was incomplete. The result of these philological misconceptions has been the dismissal of ancient concepts as 'mistaken' in their appreciation of anatomy and physiology, an explanation preferred to the alternative admission to erroneous translations, guilty in ascribing inappropriate and culturally biased categorisation to ancient terminology.

Further interpretative errors result from cross-cultural attempts at understanding the criteria that prompt the classification of objects. Derived from the desire to avoid complications in communication, the basis for any system of grouping is culture specific. Interpretative biases promote assumptions regarding significant criteria, in the attempt to establish the basis for ancient Egyptian classification (Weeks 1979: 61-62). Errors abound, a situation aptly illustrated by the disparity between our cultural classification of botanical and zoological objects that focuses upon physical attributes, and alternative classifications that might favour social, environmental, geographical and even usage criteria (Weeks 1979: 63-64). More explicitly, dwarfs in ancient Egypt were probably classified by social status, a circumstance that has resulted in many years of confusion in our attempts at identifying the two specific genres mentioned in texts. We incorrectly assumed that our classifications corresponded to those of the ancient Egyptians, applying medical definitions (achondroplastic and metabolic dwarfism) instead of social differentiation (high and low status: Weeks 1979: 73). Lexicography requires the careful examination and appreciation of numerous examples before the criteria for categorisation can be attempted.

Texts that have survived within the documentary record are frequently incomplete, due either to scribal omission in antiquity (as we assume to be the case with the Edwin Smith papyrus), intentional destruction, or as a result of subsequent decomposition. All cases of fragmentation result in an imperfect opportunity for understanding. Scribal inaccuracies, particularly when copying documents, pose a constant challenge for the translator (Nordh 1996: 142), and often provide the potential for the introduction of alternative or preferred interpretations by the modern scholar, where inconsistencies are denoted errors for ease of understanding.

13.4. Cultural and literacy biases

13.4.1. *Cultural biases*

Textual content was regulated by strict conventions that dictated the suitability of subject matter and subsequent access to documentation. Composition was governed by ideological and traditional concepts, both of which contributed to the limitations of a formalised script remote from the spoken language (Parkinson 1991: 19), a cultural refinement that inhibited the progression of the written language over time. The introduction of hieratic, as an abbreviated form of the pictorial hieroglyphs, was restricted to administrative and other secular and funerary contexts, whereas the hieroglyphs maintained their exclusivity in monumental and prestigious contexts.

Subject matter was governed according to context. Temple inscriptions were controlled by ideological, religious and political conventions that rarely challenged the concept of order and balance, and perpetuated the contrast between the ideal and the real (Hornung 1992: 115-129). The ancient Egyptians believed that the written word was imbued with independent powers and that precautions were required to avoid encountering the actual situation portrayed by the pictograms, words or phrases, particularly in a funerary context. Consequently, references to death, for example, were frequently disguised (Chapter 4: 4.2.). Misfortune and hardship were similarly under-represented in a formal context (Chapter 4: 4.1.) aptly demonstrated by the inclusion of orderly depictions of occupational activities in elite tombs, that frequently rejected a more realistic presentation of the hardships involved in the tasks portrayed. In accordance with the conventional portrayal of the non-elite (Chapter 14), their associated phrases demonstrate a similar standardised format of unobtrusive, efficient productivity (Parkinson 1991: 59). This promotes an elite concept regarding the workforces (Chapter 17), and contributes no assistance in the quest for a realistic assessment of non-elite working conditions.

13.4.2. *Literacy biases*

Writing is thought to have developed, in the late 4th millennium BC, in response to the increasing complexity of administrative management and as an integral part in economic growth and control (Pardey 2001: 13). Throughout the pharaonic period, writing remained a minority occupation, with the majority of the population pursuing an oral culture. I concur with Parkinson (1991: 18) when he suggests that the

distinction between the literate elite and scribal class and the illiterate majority reflected a wider social, cultural and economic division. This differentiation restricted the potential development of the written language into a comprehensive medium for personal expression. The restrained access to a scribal education perpetuated the association between status and literacy. The scribal class inevitably became indispensable to the elite, whose regard for the profession prompted the development of statuary representing officials and even royalty in the traditional pose of the scribe.

The direct impact of the scribal system upon documented information about the workforces was that the non-elite possessed no direct access to literary expression. Even at Deir el-Medina, where it has been proposed that the diversity of written material reflected a higher proportion of literacy amongst the workers (Baines and Eyre 1983: 86), there is no evidence to suggest that a small group of scribes was not operating on behalf of the community. Unfortunately it is not logistically possible to complete detailed palaeographic studies on this material owing to its international dispersal throughout the museum network (Janssen 1992: 83). At Deir el-Medina, as throughout ancient Egypt, literacy levels remain conjectural and inaccurate, particularly when expressed as a proportion of unsubstantiated population figures (Baines and Eyre 1983: 65). For example, Janssen (1992: 83) argues that the unpredictable promotion to the chief workman's position suggests that a high level of literacy prevailed, providing a wide range of candidates. On the contrary, the erratic selection procedure may have been due to the fact that natural successors were not literate and therefore eliminated from the competition. Clearer evidence for high levels of literacy exists perhaps in the estimated 30,000 ostraca with literary texts retrieved from Deir el-Medina (Janssen 1992: 84; Gasse 1992). Within the literate classes, varying degrees of expertise would be expected, ranging from full literacy, through to the basic understanding of a limited vocabulary (Baines and Eyre 1983: 89-90).

To summarise, aspects of evidential survival have directly affected the availability of documentary sources for study. The translation and interpretation of the evidence is subject to misunderstandings that are then perpetuated in subsequent studies. The elite bias inherent in the textual evidence, in terms of literacy, seriously restricts our

understanding of the non-elite workforces, as references were invariably indirect or implied and, by nature, subject to the restrictive conventions that controlled the documentation of formal literature.

Chapter 14

Biases in the artistic representational sources comprising the presentation of the human form and scenes of occupational activity and their effect upon our ability to access information regarding the health of non-elite workforces

14.1. Excavation, survival and burial practice biases

Excavation, evidential survival and burial practice biases have conspired to favour the preservation of elite funerary information. The limited sample of evidence from non-elite burials suggests that tomb scenes were confined to elite contexts, so the absence of workers' cemeteries is perhaps less critical for the study of artistic representations than would have been expected. Of course, the identification and analysis of low status cemeteries remains vital for a greater understanding of social dynamics and to substantiate hypotheses about the range of diseases and injuries experienced by the workforces. However, in the absence of associated depictions and models, as a source of artistic references their study is obviously less significant.

14.1.1. *Excavation biases*

Historically, the focus of Egyptology has centred upon elite structures, both in funerary and non-funerary contexts, promoting a substantial bias in favour of a non-representative minority. This interest is due, in the case of elite burials, to their accessibility and the possibility of retrieving valuable funerary equipment (Chapter 16: 16.1.1.; 16.2.1.). The demand from public and private collectors and the antiquities market has encouraged the identification of elite tombs, but has also unfortunately promoted the destructive practice of the physical removal of tomb scenes. One positive outcome of the scholarly elite bias has been the meticulous recording and subsequent publication of detailed studies of tomb scenes from royal and private structures (for example: Davies 1900-1948; Blackman 1914-1953). In many cases restricted access and/or subsequent damage to the originals have rendered these copies invaluable to the record of funerary artistic representations.

14.1.2. *Evidential survival biases*

Egypt has sustained a 3000 year tradition of tomb robbing dating back at least as far as the 20th Dynasty (1186-1069 BC) (Peet 1930). Recently, the plunder of major

structures in addition to inscriptions, tomb scenes and artefacts was a common institutional and private practice, especially during the 19th Century (Fagan 1977: 128-187; France 1991: 124), but still continuing today. This has been destructive both to individual tomb scenes and in displacing contextual information. Egyptologists have, in the past, adopted a cavalier attitude towards the monuments under investigation, utilising, for example, tomb structures as kitchens (Reisner 1932: 1), where preservation of information was not a priority.

Local practices are also evidentially destructive where, for example, villagers at Qurnet Murai in Luxor preserve an ancient tradition in occupying settlement areas that impinge on ancient funerary sites, including the utilisation of tombs as basements for their houses (Kampp-Seyfried 1999: 812). Stone blocks from funerary superstructures, particularly at Giza (Harpur 1987: 7), have been reused in modern construction destroying both the architectural data and its context. Currently, reconstruction projects among the mastabas in the Western cemetery at Giza are driven by the promise of increased tourism, as opposed to conservation of the evidence, altering and disguising the original structures and encouraging visitors and their inherent problems to visit a poorly documented area of the plateau.

To gain a fuller appreciation of funerary practice throughout society it is desirable to study a cross-section of cemetery types and locations. A greater appreciation of the architectural features, decoration and artistic representations adopted, if any, by the non-elite would then be gained. It would appear that not only have the intentional excavation biases discussed above (14.1.1.) influenced our ability to achieve this aim, but that environmental changes have also promoted the survival of the elite data in preference to the non-elite funerary archaeological evidence. The nature of the Nile valley and Delta flood plains, as the focus for settlement and development in Dynastic times, suggests that, to an extent, comparable survival biases that hamper the study of ancient settlements (Chapter 15: 15.1.2.) also inhibit the identification of non-elite burial sites (Chapter 16: 16.1.1.). Subsequent climatic and geological changes are likely to have obscured the ancient remains in both categories, whereas elite funerary sites tend to adopt elevated positions above the flood plain. The concentrated agricultural and settlement areas along the banks of the Nile result in a constant system of reuse and redevelopment over time (Chapter 16: 16.1.1.). It is important to

appreciate that the scope for the study of artistic representation in a funerary context is limited to what remains after millennia of intentional abuse and environmental change.

14.1.3. *Burial practice biases*

The selection, by the elite, of burial sites in prominent and/or ritually significant locations, such as in association with the royal pyramid complexes, or at the pilgrimage centre of Abydos, has influenced their chance of survival, protected against subsequent development of the site, and prioritised their preservation and excavation. Elite tombs incorporated within their characteristic stone superstructures have been physically advantaged in terms of survival, although their visibility within the landscape has increased their vulnerability to looting.

The preparation of the tomb and the ritual of mummification, in anticipation of the Afterlife, were of paramount importance to the royal and elite members of society. The tomb structures were built to endure, in contrast to the simple sand burials for the non-elite. The visible structure of the tomb was in itself a symbol of status (Bard 1992: 8), emphasising a social differentiation in terms of the nature of elite burials, as opposed to those of the remaining majority of the population. The precise correlation between status and tomb architecture and funerary goods remains a subject of debate (Bard 1994), but it is evident that the opulence of the burial sought to reflect privilege during life, and had been a manifestation of social differentiation since the Predynastic (Bard 1992: 2-3). The highly elaborate tomb decorations favoured by the elite contrasted radically with the limited evidence for those of contemporary lower status individuals. Baines (1994: 88) suggests that the convention of artistic representation, as an institution, defined the division between the elite and the non-elite and perpetuated that division. Although this is likely to be true, it is difficult to confirm without further evidence from non-elite tombs. The royal privilege bestowed upon the elite, who sited their mastabas within the royal complex of pyramid fields, during the Old Kingdom, potentially represent a reciprocal arrangement, whereby they perpetuated their role in serving the king in the Afterlife in return for a prestigious burial. The satellite pits associated with these mastabas at, for example Dashur, are thought to contain the funerary remains of the non-elite members of the

households associated with the pyramid town (Seidlmayer pers comm). They remain unexcavated to date.

Two-dimensional artistic representations, in a funerary context throughout the Dynastic period, display a range of occupational activities including their associated workforces (Chapter 9). The representation of the 'working classes' and 'artisans' form part of the scenes denoted 'daily life' within the mastabas and tombs of the elite or 'professional' sectors of society. The illustrations were subject to commissioning and approval by the elite: the resulting images correspond with elite perceptions and fulfil a complex ideological function. A significant exception to the social disparity in burial practice comprises the tombs of the comparatively 'more-elite' artisans at Deir el-Medina. Their specific occupations in overseeing the rock tomb excavators and decorators for the New Kingdom royal necropolis at the Valley of the Kings facilitated the preparation of their own tombs at their convenience. The unique position of these workmen at Deir el-Medina distanced them socially from the body of the lower economic groups in ancient Egypt in addition to the remaining members of their own community. I would hesitate to categorise specific occupations as 'less-elite' in relation to each other, as the tendency to ascribe value judgements to tasks in ancient Egypt is misleading, and the tendency to apply cultural biases is virtually unavoidable. The disparity between the decorated workers' tombs at Deir el-Medina as compared to the more characteristic 'less-elite' burial pits is likely to reflect the differing skills, raw materials and opportunity, in addition to the anticipated higher status for professional workmen involved in the crucial preparation of the royal tombs.

The study of funerary art in ancient Egypt is thus confined to a proportion of elite tombs, not only unrepresentative of society as a whole, but also, owing to survival and past human intervention, potentially unrepresentative of the elite as a class. The sample of tomb scenes available for analysis is, despite the biases, comprehensive and diverse, and as this study is concerned with individual scene-content and not a quantitative analysis, the information remains viable. Elite burials from many administrative and occupational groups across a broad time-scale have been identified. The consistency in the selection and form of the scenes suggests that the sample may represent a general category of tomb art that may be applicable to other,

as yet undiscovered, tombs. The limited evidence from the artisans' tombs at Deir el-Medina and the administrators' tombs at Giza suggest that, where members of the non-elite were enabled to acquire their own tombs, the format and decoration attempted to mirror that of the elite.

14.2. Artistic representation interpretation

The concept of art is notoriously complex to elucidate, and attempts at clarification include a combination of aesthetic attributes, symbolism and a medium for the communication of ideas (Layton 1991: 4-6). The interpretation of ancient Egyptian art has been and is the focus of many detailed studies that attempt to define this ancient medium in terms of modern constructs. The tomb scenes require consideration within their context of elite bias, functional, symbolic and aesthetic criteria, and any attempt at complete comprehension is over-ambitious (Baines 1994: 67). The scenes were not intended to convey any personal artistic expression, as demonstrated by their predominant conformity to conventions and the absence of individual signatures. The artistic representations of occupations in the tomb context were devised to ensure the continuity of material wealth for the elite in the Afterlife, an ideological function potentially taking precedence over aesthetic criteria. A discussion of the function specifically of the occupation-related scenes has been included above (Chapter 9). Any interpretation of these scenes must be mindful of the pragmatic considerations that influenced their content and format.

The notion of 'functionality' has prompted discussions as to whether ancient Egyptian art was 'art' at all (Layton 1991; Baines 1994: 73). I consider that, for the purposes of this chapter, in the absence of satisfactory definitions, we can accept that ancient Egyptian artistic representation comprises an important category of visual communication, albeit restricted to an elite or divine audience. The biases imposed by cross-cultural interpretation will ensure that the scope for alternative explanations is comprehensive.

If a primarily functional purpose for the tomb scenes in terms of the communication of ideological and religious concepts is accepted, it is likely that the depictions also fulfilled a decorative or aesthetic aspiration in conveying a perceived ideal (Davis 1989: 201). It is impossible to establish aesthetic criteria in an ancient context, when

it is frequently highly problematic amongst contemporary cultures (Layton 1991: 12), but it is likely that the favourable aspects of life were represented for perpetuity. Iconography, ideology and aesthetics were inextricably combined in an effort to establish an idealised environment for the Afterlife. Robins (1994: 23) has made a useful distinction between formal and informal art, whereby the former consists of idealised scenes and subjects focusing on the tomb owner and offerings made to the gods, and the latter provided the artists with more scope for expression. This informal category, as a body of evidence, is likely to be the most informative regarding the workers of ancient Egypt and their health status.

14.3. Cultural and ideological biases

The cultural and ideological belief system in ancient Egypt, in terms of the materialisation of power and the concepts of standardisation and balance, distorted the method in which funerary art was portrayed. These factors restricted the facility for personal expression and the opportunity for the inclusion of specific details within the scenes.

14.3.1. *Power ideology*

Dynastic art was utilised by the elite to enforce and perpetuate their power. The notion of dominance was achieved through the communication of ideologies by the use of the artistic medium, and by the control of resources (Baines 1994: 71) and by restricting the artists to the canonical traditions, thereby limiting their scope for artistic expression (Bianchi 1995: 2533). Traditional iconographic statements were employed to emphasise the power and authority of the king, particularly in the temple context, where the preservation of *Maat,* the concept of cosmic order and basis of social equilibrium was illustrated as being a prime function of the leadership (Hornung 1992: 34). Funerary practice focusing on the royal burial in the pyramid or tomb was central to the communication of power ideology, in the logistical, economic and visual sense (Bard 1992: 4-6). Depictions of workshops, from the Dynastic period, demonstrate a predominance in their affiliation to official or temple establishments (Drenkhahn 1995: 332-3), supporting the concept of a system of functional units within a temple 'household' (Lehner 2000c: 294). Their inclusion within a tomb context reflects the significance of craft specialities in the perpetuation of the royal funerary cult.

It might be anticipated that the ideological dictates that minimised the inclusion of misfortune in formal records (Chapter 4: 4.1.) would similarly suppress the introduction of physical abnormalities into an elite funerary environment. The idealised representation of the tomb owner conforms to this expectation, but the subsidiary figures demonstrate deviations from convention (Chapter 7). The embodiment of abnormalities and disabilities in a tomb context risked the admission of disorder into a controlled environment (Baines 1991: 138), in favour of the presentation of irregular details. Their inclusion suggests an intentional relaxation of the rigid conventions that determined the portrayal of the human figure, introducing informality to the depiction of minor figures within scenes. The broader implications of this latitude are perhaps indicative of either the non-recognition of disabilities as 'abnormal' or negative features, or of a failure to associate them with disadvantage and disorder, and both possibilities are discussed below (Chapter 17: 17.2.).

14.3.2. *The concept of balance between standardisation and improvisation*

The stability and order imposed by the canonical traditions in tomb decoration symbolise a manifestation of the portrayal of a controlled world, in contrast to the unpredictable and irregular reality (Davis 1989: 207). The aim of the depictions was to produce enduring mental images, transcending reality and encapsulating a concept rather than a specific event or person (Weeks 1979: 68). The resulting representations were both idealised and generalised. The concept of order and balance permeated most aspects of ancient Egyptian culture. The importance of symmetry is attested by the arrangement of artistic composition, but slight variations were introduced where details furnished the representation with life and interest, avoiding mechanical expression (Hornung 1992: 77). This balance between order interspersed with significant and potentially eloquent details was an important catalyst for progress (Hornung 1992: 82).

'In ancient Egypt we find the yearning for limitation side by side with desire to transcend and dissolve all boundaries' (Hornung 1992: 91).

This idea of notional improvisation on a traditional theme or 'extending the existing' (Hornung 1992: 82) is apparent in numerous examples of ancient Egyptian cultural conventions. Individual kings emphasised the importance of extending the

boundaries of the kingdom (Erman and Grapow 1971: volume 5: 236, 2). New Kingdom temples were subject to repeated additions and modifications with each reign. Funerary architecture progressed from mastabas to the step pyramid through to the true pyramid, each stage developing the theme of its predecessor. The reluctance to explore new ideas without the reliance upon tradition is aptly demonstrated by architectural innovations at Saqqara where experiments with stone construction mirrored those of tried and tested wooden structures, and stone vessels were manufactured to resemble prototypes in reed. This concept was projected into the funerary context where the Afterlife was visualised as an extension of this life, and the development of texts and inscriptions originated with the Pyramid Texts, developed into the 'Book of the Dead' and later the Coffin Texts.

In an artistic context many examples exist where the 'borrowing' of scene content or composition is evident (for example: Fischer 1959: 250; Harpur 1987: 22-31), with individuality introduced through the detail. The inclusion of striking physical characteristics provided an excellent mechanism with which detail could be added to standard presentations and may provide some explanation for the inclusion of anatomical abnormalities.

14.4. Conventions relating to the depiction of the human figure

An understanding of the role of the conventional biases in distorting the artistic representation of the human form is vital in the appreciation of the significance of abnormalities. The method in which the human figure was represented in ancient Egyptian art is a much-discussed subject and is important in the appreciation of the significance of physical abnormalities. Ancient Egyptian artistic representation, especially of the human form, constitutes a perfect example of how illusive the understanding of meaning and purpose in an ancient context can be. I consider it to be inaccurate and potentially futile to ascribe modern mathematical concepts to this ancient medium, however, the discussions themselves illustrate this point aptly.

In general, it is agreed that a stylised combination of 'nature and geometry' was utilised, which produced an unnatural but expressive representation without the incorporation of the rules of perspective (Frandsen 1997: 72). There are several conflicting opinions as to how this was achieved and standardised, and the technical

criteria applied by the artist. The ancient Egyptians utilised a grid system, indicated by surviving lines in unfinished compositions, to assist with the scale and layout of representations (Robins 1994). The registers and standardised format of many scenes bear further witness to this practice. In the attempt to understand these procedures, conventions have been proposed by which scholars consider the artist may have positioned, grouped and proportioned his subjects within registers (Davis 1989: 33-34). Whilst I accept that establishing criteria is important in order to appreciate exceptions, the anomalies are almost so numerous as to render the categorisation meaningless.

Conventions have also been devised concerning the individual appearance of the figures themselves. These are significant if an understanding of how standardisation of representation masked reality is to be attempted. Methods were adopted in which the proportions of the human figure were idealised and established as a pattern for future representations. Deviations from this practice have been viewed as intentional expressions of individual traits, as exceptions to prove the rule (Iverson 1975: 7), or as mistakes (Weeks 1984: 148). I would suggest that in many cases it is possible to differentiate between an artist's error and the intentional depiction of abnormalities, where a selection of examples illustrate a departure from convention in favour of a positive intention of expression (although the reasons for them remain obscure).

'The Egyptian method of representation aimed at showing things as they existed in the imagination of the artist who accordingly rendered them as they 'really were', and not as they were seen, that is, without having recourse to foreshortening, shadow, perspective. What is stored is a mental image of the prototype or 'genus' of the object.' (Frandsen 1997: 71).

It is naïve to suggest that all artists' imaginations produced the same image, but nevertheless this statement reflects the principal complication in the interpretation of ancient Egyptian artistic representation and requires further explanation.

Schäfer (1986: 314) identified a concept of 'frontal images', composed of the aspects which the artist considered to be of the greatest significance. The human figure was divided into horizontal slices that were rotated to present their most typical view.

Peck (1996a: 799) is in agreement with this definition, stating that the '....various aspects of the different parts are united to make up the symbolic image of man, not the observed representation known to us by experience.' The lack of perspective allowed figures to appear as they really are and not as we see them, for instance, foreshortened and partly concealed. The resulting representation bears no relation to the positioning of the artist, as regards the object depicted, but reflects the mental images personal to that individual (Schäfer 1986: 137-8). The consistency in representation strongly suggests a formal training for the artists, most likely to have been based in royal workshops (Peck 1996b: 790).

Iverson (1975: 6-7) emphasises the importance that each representation had to be complete, without omissions or foreshortening. This was significant in the context of tomb painting where an eternal image was being portrayed. It is clearly impossible to show a two-dimensional figure with no omissions. Iverson attributed the appearance of the human figure in two-dimensional representation as the result of a technical process: '.....parts protruding from the three dimensional plane must be seen in profile, and parts extending on the plane *en face*.' (Iverson 1975: 35). This theory assumes that the subject was viewed front-on, which was not always the case. I consider this to be a technological explanation for an ideological and functional form of expression. Frandsen (1997: 73-4) also criticises this theory as being limited to the portrayal of human and animal forms and not relating to more general ideological concepts.

An alternative and, in my opinion, another overly scientific explanation, has been provided by Davis (1989: 13-15). He describes the representation of the human figure as a series of sections through the body. These sections, being flat, required no law of perspective to highlight curves. Surfaces were therefore not depicted unless they coincided with the section outline. Contours were, however, highlighted, with muscular definition in particular. Frandsen (1997: 75) cites examples where objects are shown passing through solid surfaces and hence are not represented in section.

A more suitable explanation is posed by Robins (1994: 13) who refers to the human form as a '.....composite diagram. The result is immediately recognisable as a human figure, although it plainly does not correspond directly with reality.' The use of the

word diagram, I consider, most accurately describes the representations as it suggests clear and simple outlines with minimal unnecessary detail. Davis (1989: 204) also describes the canonical image as being 'typical' or 'universal', the generalised picture being favoured above specific details. There is a problem, however, with the identification of what constituted 'typical' and 'universal' for the ancient Egyptians. Cultures identify 'significant attributes' differently according to the priorities within their society (Weeks 1979: 65-66). The representations in tomb art were the result of the artist's attempt to portray a compromise between what is 'useful' and 'ideal' (Weeks 1979: 68). Details were included only to clarify the identity of the object or person and not to represent actual details or people. Any convention for representation, once established, would have been clearly understood and simple to interpret, as with any modern technical drawing convention, where, for example, broken lines or sections are used to indicate hidden details.

The evidence suggests that the ancient Egyptian artists were instructed to portray the human figure in a certain way. How this convention was devised might provoke an interesting discussion, but is beyond the scope of this chapter. What is important, is the recognition of the conventions in order that deviations can be evaluated. It could be considered advantageous, in the identification of abnormalities, that individual expression was limited, as the exceptions are rendered more apparent.

14.5. Conventions and the depiction of anatomical abnormalities

Standardisation would be expected to eliminate the inclusion of any abnormalities, with the possible exception of the occasional artistic error. Having developed a system of conventions, why would exceptions to the rules occur? It is important to appreciate that the overwhelming majority of representations of the human figure, in a funerary context, conform to conventional parameters and show no signs of abnormalities beyond those dictated by iconographic standardisation. A differentiation has to be made between the depiction of specific abnormalities and the dictates of conventions which, for example, encouraged the depiction of left hands on right arms and vice versa (Robins 1994: 16). No attempt was made to be strictly realistic, a situation attested by the inclusion of contortions and compositional irregularities (Frandsen 1997: 72). I disagree with the suggestion that deviations in general represented the result of further canonisation (posed by Davis 1989: 46),

based upon their comparative scarcity and lack of consistency. Other alternative explanations for variations include the attempt to express a concept beyond the laws of convention, technical inadequacy, intentional expression, or the artist's sense of humour (Schäfer 1986: 46; 57). It is not possible to eliminate artist error completely from the equation. Each example has to be evaluated individually within its context. A higher frequency of occurrences of any particular abnormality suggests the intentional expression of ideas, or an attempt at achieving greater accuracy (Weeks 1984: 99). Abnormalities, where included were, perhaps likewise, incorporated to clarify the role and social standing of the individual (Weeks 1979: 72).

The occurrence of innovative deviation from the norm and the inclusion of anatomical abnormalities in particular, in conforming to a generalised and characteristic presentation, would be expected to be depicted only where their inclusion clarified the role of the worker and the overall recognition of the task. The details become significant in understanding what was 'typical' as opposed to representing the actual prevalence of any specific condition. The scenes depicting occupations are, however, unambiguous: boat makers are depicted making boats and reed carriers are shown carrying reeds. Anatomical details are not essential for the clarification of the situation, or the role of the individuals involved. It might be expected that the depiction of personal attributes, if associated with specific occupations, would demonstrate a greater consistency of inclusion, both within the individual scenes and throughout time. Individual observation perhaps superseded conventional dictates where, for example, a concentration of the depiction of possible schistosomiasis, amongst water-based occupations, is seen during the Old Kingdom. The human remains evidence suggests that the disease did not disappear after this time and sufficient depictions have survived, from later periods, illustrating the same occupations but without the inclusion of abnormalities. It is possible that the borrowing of artistic expressions, evident in tomb scenes, has distorted the record, but the copying of images would be expected to perpetuate the detail as opposed to excluding it. The mental images of the abnormalities had to originate at some point in order to have been included within the artistic repertoire. A greater freedom of expression is demonstrated by the human figures depicted on ostraca, with the use of, for example, unconventional frontal images (for example: UC 33243. Page 1983: 34), indicating the scope of the artist when not confined to conventional presentation.

Abnormal body shapes possibly constituted caricatures emphasising real features (Dasen 1993: 38-9) and demonstrate the artists' ability to observe, capture and record anomalies through artistic expression.

Up until the New Kingdom, tomb scenes demonstrated a lack of individuality, a circumstance particularly marked at Giza (Harpur 1987: 7), suggesting that conventions controlled the content rigidly, although, confusingly, the incidence of the representation of anatomical abnormalities declines after the Old Kingdom. This, of course, may be due to the accident of survival, but the identification of tombs from the Middle and New Kingdoms is extensive. The diversification, seen during the New Kingdom, indicates a greater capacity for expression, but the variations themselves are difficult to interpret (Davis 1989: 200). The capacity for creating tombs and partaking in the Afterlife permeated a broader section of society during the New Kingdom, and this may have resulted in a slackening of iconographic restrictions.

Tomb scenes in a royal context were idealised, and the deceased king was depicted as youthful, strong and healthy. It was important to present an enduring image of the deceased, transcending physical defects, in preference to a realistic semblance (Hornung 1992: 174-5). Even when a name or title identified the subject, the representation was not intended to resemble the person in reality (Weeks 1984: 99), and individuality was indicated by the name alone (Scharff 1937: 178). Consequently, it is unlikely that actual personal traits were being recorded. There are, however, a limited number of elite and royal depictions where facial characteristics can be seen to include specific individual attributes (Schäfer 1986: 17), although there is little evidence for the concept of artistic expression in an environment that was patron led and thus inhibited (Assmann 1996: 55). True portraiture was not attempted as even where 'unique' features were included other physical aspects conformed to convention thus avoiding a realistic representation (Weeks 1984: 127).

Comparisons have been possible in a number of instances where the human remains for specific royal individuals have been compared to their tomb representations and the disparity has been noticeable. A famous example is the case of Siptah, whose deformed foot is confirmed by his human remains evidence (Harris 1999: 540), but

absent from his representations (Davis 1908: pl. 2). This portrayal of the idealised human form was concordant with the perceived importance of maintaining an intact body for the Afterlife, suggested by the process of mummification which aimed to preserve all body parts, including those removed during the procedure and often the associated instruments and equipment. Replacement body parts were incorporated where necessary to maintain the appearance of completeness (Ikram and Dodson 1998: 130). The idealisation of the royal and elite sectors of society colluded to highlight the social disparity from the non-elite (Baines 1994: 72). It might be expected that the non-elite would be depicted with greater realism, accentuating imperfections, for greater contrast.

Representations of the non-elite do indicate a greater forbearance of anatomical abnormalities with statuary and tomb scenes featuring, for example, dwarfism, skeletal deformities and blindness. A range of activities and occupations were detailed and the associated human figures occasionally demonstrated a consistency between physical irregularities and tasks (Chapter 7). The greater potential significance of the inclusion of abnormalities, in terms of the social implications is discussed below (Chapter 17: 17.2.).

To summarise, the concentration upon elite funerary preparation has facilitated the accumulation of a corpus of published artistic representations. The Egyptians' incorporation of the non-elite within 'scenes of daily life', despite the dictates of conventional portrayal, provides valuable information upon the potential standard of health and specific diseases experienced by particular sectors of society.

Chapter 15

Biases in the archaeological evidence for settlement sites and occupational settings and their affect upon our ability to access information regarding the health of non-elite workforces

15.1. Evidential survival

The majority of agricultural communities would have been located adjacent to the Nile. The inadequate representation of these settlements within the archaeological record is due to a combination of professional biases that have favoured the excavation of elite and funerary remains, and evidential survival biases that have resulted in the poor preservation of the settlement data. Alluviation, cultivation, redevelopment and changes to the course of the Nile have all contributed to the lack of evidence for domestic architecture in the archaeological record (O'Connor 1993: 578). Deposits of alluvium, often metres deep, have obscured the evidence for flood-plain sites (Adams 1997: 91), rendering location and excavation both costly and logistically problematic. It is likely that excessive floods eradicated villages, not elevated sufficiently above the flood level, and subsequent sediments have buried any remaining traces (Hassan 1993: 559). The settlement at Giza indicates the destructive force of rains and floods on mud brick structures, an inherent problem with a flood-plain location (Butzer 2001: 4). The traditional and ongoing practice of the *sebbakhin,* who cut swathes through archaeological deposits for the purpose of fertilising their fields, have destroyed settlement evidence, often discarding artefacts in the process (Adams 1997: 91). Further specific activities are equally destructive where, for example, the mechanical removal of sand from the desert areas surrounding Cairo, for use in road construction, has also cut into and extracted whole areas of archaeological evidence (Lehner 2001a: 2). Inaccessibility, due to the continued occupation of settlement sites, further hampers their identification and excavation (Bard 1999: 3). The shift in the course of the Nile has undoubtedly eradicated a high proportion of both settlement and burial deposits (Butzer 1976: 33-38). There is evidence to suggest that, in some areas, the Nile valley location has been consistent, but excavation of even pronounced tell sites is hampered by the professional biases discussed below (15.2.). Formation processes that have destroyed a proportion of flood-plain settlements have consequently biased the record in favour

of the desert-based sites that cannot be considered representative of settlement patterns in general (Kemp 2000: 78).

Settlements were assembled principally from mud brick, a material favoured for its ease of production and versatility. Stone was preserved for the construction of elite tomb and temple monuments. Unfortunately, the survival qualities of mud brick do not rival those of stone, frequently resulting in the limited preservation of foundation courses that fail to reflect the potential complexity of the architectural features that they supported (Kemp 2000: 78). The settlement at Giza was unusual in its use of a combination of mud brick and stone in its construction, possibly reflecting the availability of both materials, and improving its degree of evidential survival, despite water erosion. The detail of the potential form of complete domestic structures can be hypothesised from the 'soul houses' included within elite tombs (Eigner 1999: 255-256). This constitutes a large area for discussion, but presumably they were modelled upon the more desirable aspects of domestic architecture and are consequently less representative of non-elite structures.

The archaeological evidence for occupational settings, where located within the settlements, has suffered from the same restrictions imposed by the accident of survival. The installations that have survived tend to be attached to state-planned settlements as at Lahun and Giza (Chapter 10). Within these settings we are witnessing the influence of the state in the design and economic productivity of occupational units. Their function was primarily involved in provisioning large seasonal workforces or in preserving a temple economy. Their construction was frequently purpose-built and the degree to which these installations related to the possibly more informal occupational settings attached to domestic settlements is difficult to evaluate. Supporting evidence for occupational settings comprise the tomb statuettes and models from Old and Middle Kingdom funerary contexts (Chapter 9). They provide useful information concerning the processes involved and the setting for occupational activities (Peck 2001: 102). Their correlation with New Kingdom tomb scenes suggests a degree of continuity in procedure and technology through time.

It has been suggested (Lehner 2001b: 2) that the necessity for greater productivity prompted the development of numerous small occupational units as opposed to the

construction of one centre with the capability of fulfilling demand. This is perhaps aptly demonstrated by the plethora of small bakeries excavated at Giza. This situation raises questions concerning our perceptions of the differentiation between occupational and domestic procedures and at what point, if at all, do occupations become separated from the domestic setting. At Giza, there is an indication that tasks originating within the home, such as baking, continued to reside there, perhaps explaining their presence in quantity. By comparison, those occupations that required specialist equipment, for example brick manufacture at Mirgissa (Vercoutter 1970: 214-216) and pottery production at Deir el-Medina (Bruyère 1939: 264) warranted distinct installations. The possibility that occupations devoted to provisioning the state, as opposed to the local community were viewed and accommodated differently cannot be excluded. We may be seeing the reflection of the concept of the state as an 'extended household' (Lehner 2000c: 294) with its numerous and diverse requirements within an occupational context.

15.2. Professional and excavation biases

15.2.1. *Professional preoccupations*

Egyptian archaeology has typically concentrated upon the architectural information and artefact record revealed by the tombs and temples. Favoured by the accident of survival and their dominance in the landscape, tomb and temple studies have overshadowed research in settlement archaeology, often resulting in the permanent loss of information (Butzer 1976: 58). The destructive formation processes have, until recently, produced a resignation amongst Egyptologists, with little motivation to establish the extent of the loss, or to redress the balance. Excavations at, for example, Kom Rabiʿa (Chapter 10: 10.3.5) have indicated the wealth of information pertaining to the study of settlements and it is to be hoped that future projects will be forthcoming. Settlements that combine monumental and domestic architecture have witnessed an exclusive professional preference in favour of the elite information at the expense of the settlement data (for example: Karnak. Bietak 1979: 125; Meskell 2002: 33). The accessibility of the artefactually rich funerary sites has rendered settlement excavations both laborious and unrewarding by comparison (Adams 1997: 91). Both funerary and settlement information is required to provide a holistic appreciation of ancient societies. These professional biases with their resultant focus upon elite environments, most productive in terms of elite material culture, has led

archaeologists to develop the misguided concept that Egypt existed predominantly in a non-urbanised state (Chapter 10: 10.1.). This hypothesis has developed, despite the contra-indications of the textual sources, as a result of both the preoccupations with elite activities, the absence of attempts at identifying settlement sites, and the accident of survival of the archaeological evidence.

Traditionally, the discipline of Egyptology has focused on philology, with archaeology utilised to substantiate, as opposed to challenge historical 'facts' and assumptions (Kemp 1984: 19-20). Practical, in addition to theoretical archaeology constitute a minimal part of Egyptological training, a situation exacerbated with the inherent problems in gaining expertise within an Egyptian site context. As a result, archaeologists tend to be technically inexperienced and motivated by philological goals, in the form of inscription and artefact recovery (Giddy 1999a: 109). The textual sources and artistic evidence have been erroneously identified as media that provide direct access to the ancient culture (Adams 1997: 91). The inherent evidential biases discussed above (Chapter 13; 14) indicate the extent of this error.

The latter part of the twentieth century witnessed an emergence of interest in the interpretation of settlement sites, resulting in the recognition of both 'organic' and state-planned environments (for example: Kemp 1972a; 1972b; 1977; Jeffreys *et al* 1983-1996; Lehner 1997b; 1998; 1999b; 2000a; 2000b; 2001a; 2001b; Giddy 1999b). The rapid deterioration of the sites has been in part responsible for this attention, but unfortunately it has not resulted in a concerted rescue operation (Giddy 1999a: 110-111). Funding limitations for these perceived 'low-profile' sites and the shortcomings of the Egyptian bureaucratic system are largely to blame (Giddy 1999a: 112). Town sites remain poorly documented despite the recent attention, with apparent disparities in clarification of geographical distributions (O'Connor 1993: 576). For a comprehensive picture of settlement patterns to be created, an organised programme of work is required (O'Connor 1993: 577), in addition to an improved communication network amongst specialists on sites and between excavations (Giddy 1999a: 113).

In contrast to settlement archaeology, craft specialisation and occupations have received detailed attention from Egyptologists, particularly from a technological and procedural standpoint (for example: Lucas 1962; Nicholson and Shaw 2000). The

archaeological evidence for occupational settings is limited, where craft activity on a small scale is difficult to identify in the archaeological record, and the majority of information pertaining to 'factories' originates from Amarna (Eyre 1987b: 192; Kemp and Vogelsang-Eastwood 2001). Alternative sources are diverse and include the artefactual recovery of items that represent the end product of manufacture, the artistic representation of occupations in process (Chapter 9), archaeological evidence for occupational settings, tools and equipment (Chapter 11), and prosopography in association with occupational identity. Cross-evidential comparisons have been possible, resulting in a detailed picture of the methodology of specific occupations, facilitating experimental archaeology projects that have highlighted the practical implications of procedures (for example: Stocks 1986a; 1986b). This technological approach has tended to overlook the wider context of socially important areas of industry including that of pottery production (Bourriau *et al* 2000: 135). The ideological implications of the exploitation of resources have been initially explored in terms of mining and quarrying (Shaw 1998; Chapter 2: 2.1.), but the knowledge of procedures, coupled with comparative ethnographic information provides an insight into the conditions of labour, yet to be fully appreciated (Chapter 11).

15.2.2. *Excavation biases*

The excavation of settlement sites has concentrated upon a minority of historically significant but unrepresentative locations (O'Connor 1997: 15). Very few sites have been subject to detailed analysis and documentation, and the material culture for many of the smaller, possibly more representative agricultural communities have not been identified at all (Adams 1997: 90). Settlement sites that have undergone analysis include Elephantine (Seidlmayer 1996; Von Pilgrim 1997), Kom Rabiᶜa (Giddy 1999b), Gurob (Petrie 1890; 1891; Thomas 1981), Buto and Hierakonpolis (Wilson 1955; Hoffman 1971-72) and Amarna (Kemp 1984-1987; 1987; 1989). Similarly, a number of occupation-related settlements have been identified and excavated. These settlements arose from the requirement to accommodate the labour forces involved in state projects on a permanent or seasonal basis. Archaeological evidence exists for settlements comprising the temporary shelters at quarry or mining sites (for example: Anthes 1928; Engelbach 1933; 1938; Emery 1963; Shaw 1986; 1987; 1994), some of which were fortified (Emery 1963; Lawrence 1965; Kemp 1972a; Shaw and Jameson 1993). Complex towns in association with longer-term construction projects have

been documented (for example: Deir el-Medina (Bruyère 1924-1953; David 1986; Eyre 1987b; Eyre 1980; Lesko L. 1994b; Lacovara 1997; Meskell 2002), Giza (Lehner 2001b), and Lahun (Petrie 1890; 1891; Kemp 1989; Frey 2000)).

The current situation, in the understanding of settlement archaeology, demonstrates a considerable disparity in the quantity of data attached to specific sites. Textual information can provide information on the existence and location of particular sites (Wilbour Papyrus: Gardiner 1948a; 1948b), but the quality of supporting archaeological evidence varies widely. The sample contains examples that range from the detailed archaeological, textual, occupational, and human remains record attached to the site of Deir el-Medina, through to the scant settlement evidence from, for example, Thebes. The temptation to extrapolate information from an unrepresentative sample should be avoided, and the broad time frame spanned by individual sites and between 'comparative' data must be appreciated. A number of the better preserved sites, such as Amarna and Giza, were occupied for a limited amount of time and the evidence for town planning and the consequent limit to architectural adaptation cannot be compared to that of continual occupation of more 'organic' settlements.

15.3. Settlement archaeology interpretation

Discussions as to the appropriate methods for the interpretation of settlement data, both in terms of structural and geographical spatial distribution, have produced a substantial literature (for example: Trigger 1967; 1968; 1972; Chang 1968; Douglas 1972; Rouse 1972; Fletcher 1977; 1981; Moore 1982; Hillier and Hansen 1984; Roberts 1996). Research embodies comprehensive discussions upon aspects of spatial, cultural and social organisation, functional arrangement, and architectural and artefactual interpretation (for example: Cherry 1987; Kent 1987a; 1987b; 1990; Shanks and Tilley 1987; Wagstaff 1987; Binford 1992; Parker Pearson and Richards 1994a; 1994b; Steadman 1996; Nelson 2000). The historical lack of interest in settlement studies, demonstrated by Egyptologists and mentioned above (15.2.), has resulted in a corresponding dearth of contributions to these theoretical approaches (there are a few exceptions, for example: Shaw 1992; Kemp 1989; Adams 1997; Meskell 2002). Egyptologists need to become more critical of interpretative assumptions and more mindful of the theoretical approaches to the analysis of data

(O'Connor 1997: 17). Although many aspects of theoretical approaches are applicable to Egyptian and non-Egyptian sites alike, the unique geographical nature of Egypt, with the Nile providing a magnet for settlement location and development, conflicts with more general assumptions about settlement patterns within the landscape. It is beyond the remit of this thesis to discuss the vast literature pertaining to settlement archaeology in any detail. It is meaningful, however, to provide a contextual background and an indication of the interpretative complications associated with the analysis of settlement data if informative conclusions are to be drawn from the data discussed specifically in chapter 10.

A relationship has been identified between the spatial dimensions preserved within the archaeological record and the organisation of the community responsible for their existence (Adams 1997: 90). Human behavioural patterns are an accepted phenomenon (Kent 1987b: 3), of which the patterning of settlements is one aspect. The identification of these patterns provides a starting point from which the interpretation of the cultural and social activities indicated by the archaeological landscape can be attempted (Rouse 1972: 96). A settlement, once established, is subject to numerous developmental factors including subsistence economy, craft specialisation, trade and exchange, land ownership, ideological, religious, political and defensive determinants (Blouet 1972; Trigger 1972). The interpretation of the individual settlements themselves and their patterning within the landscape facilitates a greater understanding of these factors at work and their social implications for the indigenous community.

15.3.1. *Biases inherent in the establishment of settlement patterns*

Ecological, cultural and social systems, potentially identifiable in the archaeological record using a combination of geographical and anthropological studies, have been incorporated into the analysis of settlement patterns (Rouse 1972: 96). These patterns are invariably fragmentary, imposing limitations upon the interpretation of the nature and distribution of occupations and institutions (Rouse 1972: 97; Moore 1982). To accommodate the incomplete nature of the record, a system of remnant settlement pattern analysis has been devised. Disjointed patterns are replicated and extrapolated to create the 'completed' picture, a process facilitated by the application of cultural expectations and comparisons to ethnoarchaeological situations. Settlement patterns

within the landscape are designated functional distribution patterns by a theoretical process of systems analysis (Rouse 1972: 98-102). This simplistic response (as discussed by Rouse 1972: 103; Binford 1992: 52; Dewar and McBride 1992: 229) possesses a huge potential for inaccuracies, where the application of uniform expectations to specific sites is based upon assumption and ignores variability. The opportunity for misinterpretation is potentially reduced where archaeological evidence is well preserved and where supporting information is available from additional sources. Complex societies provide a greater scope for analysis (Dewar and McBride 1992). Settlement patterns in ancient Egypt have been devised in conjunction with textual evidence (Butzer 1976; Adams 1997), but unfortunately the inadequate record of settlement data hampers the identification of the broader landscape issues, concentrating analysis upon the isolated examples of the individual settlements that have survived. Consequent analysis cannot be representative of settlement archaeology where the sample consists of widely disparate components from an expansive time frame.

Two tiers of settlement analysis have been defined: micro-settlement patterns, comprising the interpretation of individual settlements, and macro-settlement patterns, highlighting aspects of the settlement's overall size and relationship to other sites (Trigger 1968: 54-55; Fletcher 1977). Further analytical diversification is provided by an appreciation of the individual structures, the settlement layout and composition, and the regional settlement patterns (Trigger 1968; Clarke 1977).

15.3.1.1. *The interpretation of individual structures*

The interpretation of structures within the settlement can provide information on construction materials, adaptation to the environment and climate, seasonal or permanent occupation, technological advancement, family composition, room function, social status, and architectural adaptation and diversification (Trigger 1968: 55-60). In particular, the nature and use of building materials (Hodges 1972) and architectural adaptations incorporated over time can be significant indicators of changes in technology and the functional requirements of the site (Fairclough 1992: 349). Where architectural structures remain in the archaeological record, as for example at Deir el-Medina, Amarna and Giza, planning diagrams can provide a detailed analysis of the standing buildings (Fairclough 1992: 351-352).

The potential use of domestic space has been widely researched (for example Douglas 1972; Hillier and Hansen 1984; Gnivecki 1987; Oswald 1987; Kent 1990). House size has been related to status (Shaw 1992: 153) and internal structure, access routes and structural composition can tentatively be associated with function. The importance of symbolic meanings must be appreciated to avoid cross-cultural generalisations regarding house design (Parker Pearson and Richards 1994a: 30), as in any form of archaeological interpretation (Shanks and Tilley 1987: 75-78).

15.3.1.2. *Settlement layout and composition*

The design and organisation of a settlement can indicate factors concerning the individual, functional aspects of the community and relative status. The overall size and location of the settlement may be determined by environmental and subsistence considerations, including trading and defensive requirements, in addition to ideological and religious issues (Trigger 1968: 61-66).

The distribution and organisation of structures within the settlement, in conjunction with the dispersal of artefacts, can denote functions, social or cultural priorities and craft specialisation (Trigger 1968: 64-65). Factors concerning population demography in terms of kin, status and social organisation can also be tentatively deduced (Allen and Richardson 1971; Shaw 1992: 156; 160). State-planned sites, for example Lahun, indicate a clear delineation between the workers' area and the remainder of the settlement (Kemp 1989: 149-157; Chapter 10: 10.3.2.), the proposed explanation for the division being based upon rank and function. There is a risk of misinterpretation at many levels where culturally specific factors are at play. Douglas (1972: 514-516) warns against the generalised inference of social or symbolic ranking from the archaeological record, as many factors in social organisation leave no evidence.

Architecture provides parameters and structure to activity systems, supplying information about the relationship between activities and the potential sequential processes (Barrett 1994: 91-92). Symbolic and/or physical boundaries represent transitions between areas (Kus 1982: 53-54; Parker Pearson and Richards 1994a: 24). For example, the 'Wall of the Crow', at Giza, constitutes a tangible and symbolic barrier between the royal pyramid complex and the functional, provisioning, industrial

settlement. Relative entrance sizes have been perceived to denote private or processional functions and the orientation of the individual components of the settlement, or the complex as a whole, for example Abydos, can be ideologically significant.

15.3.1.3. *Regional settlement patterns*

The distribution of settlements within the landscape and their relationship to each other can indicate social and political organisation. Comparable to individual settlement determinants, these include the exploitation of natural resources, economy and trade, defensive, ideological and religious factors (for example: Trigger 1968: 66-69; Kemp 1972a; Cherry 1987; Lehner 2000c). The decisive factors for these environmental settlement patterns are complex and interact with one another in various combinations to produce patterns of settlement growth (Trigger 1968: 70-71). Factors are not easily interpreted and an analysis facilitating the understanding of the function of individual settlements is required before broader assumptions about patterning can be hazarded. For example, the Nile valley provided an important focus for settlement owing to favourable agricultural land and ease of transportation. Overlying these influential factors in establishing settlement patterns, the elite-based culture of ancient Egypt is thought to have inhibited the more natural selection of settlement sites, giving precedence to state-planning for ideological, religious and cultural reasons (Badawy 1967; Lehner 2000c). Whereas these determinants may be apparent at 'pyramid' towns such as Lahun or Giza, the location of additional settlements may be subject to ideological influences or constraints not so easily identifiable.

15.3.2. *Biases inherent in the interpretation of artefactual distribution*

It has been proposed that activity areas can be identified by the study of architectural and artefactual evidence (for example: Kent 1987a; Newell 1987). It is misleading to assume that the function of a structure or complex can be positively defined, as the relationship between the archaeological record, formation processes and cultural or functional meaning is complex (Trigger 1967: 152; Camilli and Ebert 1992). Exceptional circumstances do exist in ancient Egypt, where the archaeological evidence corresponds closely to the artistic and/or textual evidence and supporting

evidence for functionality is secured. Ethnoarchaeology can provide comparative evidence for artefactual distribution patterns throughout the settlement (Murray 1980).

Interpretations are complicated by the diversity of depositional factors. Formation processes are divided into two broad categories: 'abandonment' and 'discard' (Murray 1980: 491). Where 'abandonment' or 'primary refuse' (Schiffer 1972: 161) is evident, the location of use may be indicated by the distribution of artefacts (Murray 1980: 497). 'Discard' or 'secondary refuse' (Schiffer 1972: 161) relates to intentional disposal areas, which may or may not relate to the location of use. It is not a simple procedure to differentiate between the two forms of deposition. The site and content of the refuse areas and their relationship to the settlement site is significant (for example: Dixon 1972; Murray 1980: 497; Miller 1982; Hayden and Cannon 1983; Hodder 1987), in terms of social values and environmental health. The archaeological evidence at Amarna has been evaluated in terms of socio-economic factors, where 'suburb' sampling has been utilised in order to minimise the inaccuracies that result from the reliance upon the evidence from individual structures (Shaw 1992: 156-162), a process presumably equally subject to error from generalisation. The dangers in attempting to identify social ranking patterns from the inconsistent architectural and artefactual distribution is demonstrated at both Amarna (Shaw 1992: 162) and Giza (Redding pers comm), where discrepancies between architectural structure in relation to specific artefact distribution have been noted.

Recent studies have favoured a more functional and dynamic application of the archaeological data relating to activity areas (Binford 1992: 51). Reconstruction techniques have been adopted within Egyptian archaeology to gain a greater understanding of the technological and methodological approaches adopted by the ancient Egyptians. Specific procedures have been explored, including stone working (Stocks 1986a; 1986b; 1989; 1993), baking (Roberts 1995) and pyramid construction (Lehner 1997a: 208-209). This form of experimental archaeology has been greatly facilitated by the availability of a combination of artistic, textual and artefactual information relating to tools, raw materials and procedures. The consequent reconstruction highlights aspects of manpower organisation (but not quantity of participants), productivity and the consequent artefactual distribution resultant from procedures.

To summarise, settlement sites and associated occupational settings, specifically those within the range of alluviation, are under-represented within the archaeological record. This is due to a combination of adverse survival factors and professional preoccupation with elite funerary provision at the expense of domestic activities. Attempts are now being made to redress the balance, but a significant amount of data may remain elusive due to formation processes and the re-development of historically significant sites. Traditionally, Egyptology has been reluctant to adopt a theoretical approach to the interpretation of settlement sites, which, although subject to limitations, facilitate procedures that promote a greater understanding of the domestic environment in which the ancient Egyptians lived. A gradual advance into the realm of 'social studies' for inspiration in interpreting archaeological data, as demonstrated by, for example Shaw (1992) and Meskell (1999; 2002), can only be a positive development.

Chapter 16

Biases in the human remains data for injuries and diseases and their affect upon our ability to access information regarding the health of non-elite workforces

16.1. Evidential survival

16.1.1. *Cultural biases influencing burial practice*

Ancient burial practices have favoured both the survival and consequently the identification and excavation of elite funerary remains, owing to the ideological, religious and cultural biases that determined burial procedures and location. Although the siting of non-elite burials in relation to their associated settlements is in many instances unconfirmed, it appears likely that the under-representation of both habitation and funerary sites in the archaeological record is due to the poor preservation and conservation of the evidence. Agricultural settlements would have been dispersed along the Nile and in the flood plain, concentrating into larger centres as competition for land increased (Butzer 1976: 101). The movement of the course of the Nile towards the east throughout Dynastic Egypt and subsequent millennia would have destroyed these settlements and left their associated cemeteries stranded in the desert (Butzer 1976: 35), where they have yet to be located.

The population shift into the Nile valley, thought to have accompanied the onset of the Dynastic period, due to climatic changes (Butzer 1976: 39) and possible trading pressures (Wilkinson 2001b: 315), has contributed to the poor survival of the non-elite funerary remains. The reduction in rainfall succeeding the Predynastic era resulted in desert-edge settlements like Hierakonpolis being abandoned in favour of the Nile valley (Butzer 1976: 39). The alluvial mud banks that accumulated at the edge of the desert during the Nile floods were too inaccessible for irrigation and cultivation and were consequently used for burials, as evidence for Predynastic remains has indicated (Firth 1912: 43-44). The burial and human remains data have been destroyed as the mud banks have been intentionally eroded for use as *sebakh*. It is not inconceivable that the evidence for the Dynastic burials, possibly occupying later and more accessible layers of mud, had already been removed and deposited on the fields by earlier generations of farmers, the Predynastic layers having been

reached by the early 1900s as observed by Firth (1912: 43-44). Alternatively, the declining floods experienced during the Old Kingdom would have resulted in the alluvial deposits settling in different locations (Butzer 1976: 28), in turn affecting the siting of the burials. The subsequent higher floods of the Middle Kingdom potentially destroyed the evidence (Butzer 1976: 29). The impact of high and low floods would alter the position and depth of the flood plain and consequently the desert margin dunes, along with their burials, have become either eroded or isolated (Butzer 1976: 53).

The lack of tangible evidence leaves the confirmation as to where the non-elite sector of society was buried in Dynastic Egypt a highly problematic issue. If, as suggested (Butzer 1976: 83), the population approximated at any one time to an average of two million throughout the Dynastic period over a period of 2500 years, the volume of cemetery space required to accommodate this number would have to be substantial. Whereas designated non-elite cemetery sites have been identified from the Predynastic (for example: Elliot Smith and Wood Jones 1910; Hoffman 1982; Adams 1987; Bard 1994), and Roman eras (for example: Wood Jones 1908; Elliot Smith and Derry 1910; Elliot Smith and Wood Jones 1910; Tucker and Hawass 2000), the evidence for Dynastic burials is scarce. Even the isolated example of diverse status burials at *Dra Abu el-Naga* dates to the Second Intermediate Period (Polz 1995: 7), and the inclusive nature of the burials may reflect a localised arrangement, in the absence of a central authority. The cultural diversification that characterised the development of the Dynastic 'state' also influenced the social disparity in funerary practices. It is hazardous to classify the Predynastic cemeteries as non-elite where the evidence suggests a community with minimal social stratification, or a largely egalitarian society, that would result in little differentiation at burial (Wilkinson 2001a: 301-302). The substantial quantity of surviving tombs from this period has led to the assumption that a wider sector of society was being represented in the cemetery population. Whilst this remains likely, the location of these cemeteries, at the desert edge, favoured their survival (for example Badaria. Brunton and Caton-Thompson 1928; Holmes 1999: 162). The development of funerary architecture, mummification and the inclusion of artefacts with the deceased, so intrinsically associated with the recognition of the elite in Dynastic Egypt, has led to the potentially misleading assumption that the Predynastic burials represent the non-elite in their comparative

poverty. It is entirely possible that only the elite were represented in the funerary record prior to and subsequent to state formation.

Ethnographic evidence suggests that differing funerary rites existing within a society were frequently based on social status (Ucko 1969-70: 271). The late Predynastic provides evidence of 'wealthy' child burials, implying the concept of specific and inherited wealth and the emergence of social divergence (Wilkinson 2001a: 302). There is little doubt that the Dynastic cultural climate that exalted the elite in terms of funerary provision for the Afterlife would, by implication, have limited the possible interment locations for the non-elite. The social and cultural diversification that favoured one sector of society possibly intentionally disadvantaged the non-elite to emphasise the distinction. The invisibility of the non-elite raises the question as to whether they were buried at all. Abandonment as an option is unpopular (Ucko 1969-70: 270) and overlooks the evidence for the established practice of simple sand burials in Predynastic Egypt. 'Lower class' burials, where identified, consist of pits with the inclusion of minimal funerary equipment (Bard 1994: 6), and are thus difficult to locate in a desert environment. Sacred sites or festival routes constituted an important preferential burial location during the New Kingdom (Seidlmayer 2001: 509), consequently providing a magnet for subsequent burials. Indications from Abydos, for example, confirm that this practice has favoured the survival of the elite structures belonging to those who attained this privileged position. The non-elite, if present at all, would have occupied burial positions at a distance from the focus in smaller tombs. Their dispersal on the perimeter of the site, despite their potentially greater numbers, impedes attempts at determining their location (Jeffreys pers comm). The practice of the reuse of tomb space frequently introduced less elite individuals into elite tomb structures (Seidlmayer 2001: 509), compounding confusion.

Specific cultural and social biases determine differential interment locations for sectors of the community governed by, for example, age, sex and mode of death, in addition to social status. Strategic burial locations, as at for example Abydos, dictated the nature of the cemetery populations. The high prevalence of infection noted amongst the human remains (Baker 1997: 112; Chapter 12: 12.1.3.) might reflect an increased susceptibility to disease amongst the pilgrim community, as opposed to any indication of a more general trend. Infants were frequently buried within the

domestic, as opposed to the cemetery setting (Meskell 1999: 158-159), and the sexes are often unequally represented (Seidlmayer 2001: 508), skewing demographic information from cemetery sources. The under-representation of the disabled, within the skeletal record, has resulted in numerous hypotheses including the possibility of separate burial locations distinct from the 'normal' majority, either as a result of intentional segregation, or due to distinct areas of habitation during life. Both scenarios could result in the potential for undiscovered cemeteries of skeletal material demonstrating a preponderance of physical abnormalities (Waldron 2000: 31). The biases imposed by burial practices render the burial record incomplete and disjointed, whole sectors of the society may be missing, or under-represented and extreme care must be taken in extrapolating the information provided by the inherently misleading selection of material.

Surviving evidence indicates that the elite were entombed in an elevated position on the desert escarpment, whilst those of the less-elite occupied the lower slopes (for example: Beni Hassan. Spanel 2001: 175) where the funerary remains were obscured owing to erosion and rock fall. Weathering and *sebakh* extraction at, for example *Naga-ed-Dêr* eroded the lower slope pits, whilst the elite tombs were protected by their elevation (Reisner 1932: 3). The evidence from the cemetery at Giza is consistent with the recognised patterns of burial distribution. It is significant that the tombs of the 'professional' workers and administrators were located in architecturally diverse superstructures, elevated above the flood plain, in the Maadi formation, whereas the burials of the conscripted labourers have yet to be identified. It is conceivable that the administrators, involved in the logistics of pyramid building, had their tombs constructed as part payment for, and in recognition of, their services. Furthermore, this allocation of tombs may signify that participants were buried after subsequent retirement from active duty, thus potentially distorting the burial record and explaining the later 5th Dynasty date for a proportion of the tombs. The transitory nature of the manual workforce would suggest that those who survived their corvée commitment would return to their home environment to be buried there at a later date. Texts relating to the question of the possible repatriation of the bodies of expedition casualties have been discussed above (Chapter 2). The logistics involved in returning bodies to their home environment suggests that they were more likely to have been buried on site.

On balance, it is likely that non-elite cemeteries were located adjacent to and often to the west of the settlements, close to the flood plain within the Nile valley and Delta. The chances of recovery are remote, owing to both the changing course of the Nile (Butzer 1976: 36) and the reuse of this prime agricultural land. Burials in the Delta were almost certainly located within the modern flood plain rendering them inaccessible, their identification further hampered by the similarly populated but more dispersed characteristics of living communities and consequent cemetery populations, when compared to the Nile valley (Butzer 1976: 83; 94). The Predynastic sand burials on the edge of the desert stand an increased chance of survival, both in terms of preservation of the skeletal material and from a reduced likelihood of disturbance, skewing the evidence in favour of their retrieval. The resulting situation, comprising minimal archaeological evidence for funerary practices amongst the non-elite in Dynastic Egypt, reflects this complex set of cultural and social biases.

16.1.2. *Physical and cultural biases affecting evidential survival*

The arid climate in many areas of Egypt provides a favourable environment for the survival of human remains, although the quality of data is still subject to adverse formation processes. Mummified bodies are often preserved with skin, hair and nails, and skeletal remains are conserved by desiccation in the sand. Acknowledgement of examples of this excellent state of preservation has been central to the development of studies in palaeopathology (Armelagos and Mills 1993), which combined with the advances in medical technology in the 1900s prompted the evolution of a scientific approach to research (Ruffer 1921; Moodie 1923).

The human remains evidence from ancient Egypt has been subject to a long history of intentional destruction. Prejudices in the past have resulted in an irreverent attitude towards the evidence and current priorities favour the potential identification of remarkable or sensational information. During the Coptic era the evidence was viewed as a pagan phenomenon and destroyed as a matter of religious principle (Dzierzydray-Rogalski 1986: 92). The practice of tomb robbery and the removal of human material from its burial site, with the associated destruction of provenance and loss of information, has contributed to the wholesale destruction of the evidence. For example, mummies were powdered and included in medical preparations from as early as the 14th century (Dzierzydray-Rogalski 1986: 92). The human remains have

been prized as curiosities and openly traded, mummies were unwrapped out of idle interest from the 1700s (Armelagos and Mills 1993: 1), used as fuel and included in paint as a pigment (David and Archbold 2000: 42). Mummy unwrapping reached a peak as a form of entertainment during the 19th century. The process resulted in the inevitable loss of any useful information, with the exception of the careful documentation carried out by a minority of the entertainers (David and Archbold 2000: 46-47). The late 19th century Egyptologist, traveller and writer Amelia Edwards described treasure hunters at Saqqara sifting through human bones and funerary equipment for valuable souvenirs (Edwards 1982: 51). Mummies could be purchased privately, complete with their wrappings and coffins, only to be abandoned in the Nile when their odour became unpleasant (Edwards 1982: 451). The 19th century exportation of mummies to Canada for paper processing culminated in the discard of the human remains as an unfortunate adjunct to the raw material (Dzierzydray-Rogalski 1986: 92).

Construction projects in Egypt today often fail to report archaeological findings in fear of imposed delays (Dzierzydray-Rogalski 1986: 92). Nor has professional conduct been above reproach. Certain excavations reject 'uninteresting' skeletal material depositing it on spoil heaps. Where no identifiable architecture accompanies the human remains, the evidence is frequently abandoned (Jeffreys pers comm). The intentional discard of 'unremarkable' examples of excavated human remains evidence has contributed to an incalculable loss of irretrievable data (Buikstra *et al* 1993: 26), distorting the surviving sample in favour of the elite and the extraordinary.

Recent restrictions imposed by the Egyptian government upon the removal of human remains data, in common with all artefactual material from Egypt, has resulted in the reliance for information upon existing collections. These are distributed throughout the world, originate from a broad time spectrum and geographical distribution, and the material and its relevant documentation are often difficult to trace (Davide 1973: 155), making a comprehensive and collective examination of the data logistically complicated, but not impossible (David and Archbold 2000: 155). The current compilation of databases founded upon these collections is being utilised to demonstrate standards of health and to identify diseases, facilitating comparisons across time and to a limited extent, through social strata (David and Archbold 2000:

153-161). Research remains in its infancy and findings have yet to be fully published (David 1979). Exportation restrictions result in the use of persistently unsatisfactory and inadequate resources available for the study of data within Egypt. Storage facilities are usually inadequate, with the human remains subject to the desert heat, with no attempt at conservation to delay the inevitable disintegration of the evidence (Leek 1986a: 184). Emerging data from newly excavated cemeteries is frequently unstudied, poorly recorded, unpublished, or subject to specific investigations not necessarily connected to establishing pathology. Inaccurate hypotheses enter publications (such as misguided information about medical intervention at Giza included by Tyldesley 2000: 59; Chapter 12: 12.4.) and restricted access allows little opportunity for any reassessment of the data or scholarly discussion.

Despite this catastrophic destruction of evidence, an estimated 90,000 individuals have been examined since the late 19th century, although unfortunately frequently unofficially and unprofessionally (Rowling 1986: 408). The current atmosphere within Egyptian cemetery archaeology, with the emphasis upon the retrieval of significant and media-worthy finds contributes little to the incentive for systematic investigation.

16.2. Excavation biases

16.2.1. *Practical constraints and research biases*

Inconsistent excavation techniques, priorities and standards have in the past influenced, and do in the present, affect the successful location, sampling and interpretation of cemetery data. A distinction has to be made between the official and illicit excavations, although the differentiation is not always one of professional conduct and expertise. Various logistical constraints have influenced the lack of identification and excavation of non-elite burial sites, including the expense involved in exposing waterlogged flood plains in the Nile valley and the Delta (Jeffreys pers comm). In an environment that continues to favour information regarding the activities of the elite, there are the financial implications involved in funding a project that cannot guarantee a positive result, or if successful provides an insight into an 'uninteresting' area of research.

To assess the differentiation between elite and non-elite burials a large sample of both is essential (Ucko 1969-70: 268), a requisite balance in which the ancient Egyptian funerary data is deficient. The excavation and examination of the human remains evidence from ancient Egypt has until recently, concentrated almost entirely upon the royal and elite burials. As discussed above (16.1.1.; 16.1.2.), this is due to the dominance of elite funerary architecture within the landscape and the favourable conditions for the preservation of entombed mummified material, as opposed to the simple sand burials where identified for the non-elite, in addition to the general academic preoccupation with elite achievements and associated burial goods. The elite remains are themselves subject to bias in an environment where excavation procedures have frequently centred upon artefact recovery in preference to the retrieval of palaeopathological information (Armelagos and Mills 1993: 3). The assumption has been made that the non-elite in ancient Egypt embodied the characteristics of the non-elite agricultural workers of modern Egypt, providing little interest for the Egyptologist, funding institutions, or the general public. The social environment in archaeology has been undergoing an evolution since the 1970s and attempts have been made to redress the elite bias, but the scarcity of non-elite human remains evidence continues to pose a problem.

The identification of non-elite cemetery sites has been problematic due to geological and formation processes as discussed above (16.1.2.), but, even where location has been successful, excavation has not necessarily proceeded. Geographically remote expedition sites at quarrying and mining locations must have had a facility for burying the fatalities resulting from injuries sustained and diseases contracted whilst engaged in procuring raw materials. To date, the surveys and excavations at these sites have yet to identify any cemetery areas, a situation that hampers a greater understanding of the identity of the community, and the conditions and misfortunes that the workforces experienced.

Amongst the rare examples of the excavation and analysis of non-elite cemetery evidence, the results have been subject to the inaccuracies imposed by poor excavation and recording techniques (Butzer 1976: 81). Efforts have frequently focused on the evidentially prevalent Predynastic sites, in an attempt to establish the factors that pre-determined the emergence of the state and complex society (Richards

1997: 34). These previous studies have been destructive in terms of palaeopathology, where priorities focused on craniometric measurements in an attempt to substantiate the existence of a 'dynastic race' (for example: Batrawi 1945; 1946; Derry 1956; Emery 1961), at the expense of evaluating the pathology in a constructive way. The crania were often removed and retained for research whilst abandoning the post-cranial evidence. A substantial amount of information has been lost. The exceptional circumstances that culminated in the archaeological rescue operation in Nubia in the early 20th century resulted in over 10,000 burials being excavated and examined (Elliot Smith and Wood Jones 1910; Chapter 12: 12.1.7.). Although few investigations into the history of disease had been attempted at this time, a number of diseases were tentatively identified (Elliot Smith and Wood Jones 1910). Palaeopathological interpretation in the past has concentrated upon the documentation of a limited sample of distinct and obvious examples of pathological changes (Armelagos and Mills 1993: 3). Subsequently, the retention of pathological specimens within museum and laboratory collections, and the rejection of the remaining data, have skewed the evidence and imposed restrictions upon the scope for future studies (Buikstra *et al* 1993: 26).

16.2.2. *Biases apparent in excavation site selection and sampling*

Excavation restrictions and techniques introduce a range of evidential biases that affect the accuracy of interpretations. Logistical and time constraints inevitably dictate the partial excavation of cemetery sites, a situation that indubitably results in an excavated sample of data that fails to represent the cemetery population (Roberts and Manchester 1995: 9). The retrieved sample is neither random nor representative (Waldron 2000: 42) and attempts to establish demographic hypotheses and patterns of disease within the community are hampered accordingly (Roberts and Manchester 1995: 9). The selection of specific burials for excavation and interpretation is biased and often influenced by geographical distribution, state of preservation and visibility within the landscape. The unpredictable variation in individual susceptibility to disease further results in a biased sample of deceased individuals that in no way represent the living population they constituted part of during life (Roberts and Manchester 1995: 9). The excavated human remains data, therefore, comprise an unknowable combination of individuals present in the record due to environmental, cultural and survival chances.

Demographic studies of cemetery populations are impeded by the untraceable geographical origin of the deceased, and the possible inclusion of outsiders within the assemblage, that skews the potential information about the resident community (Roberts and Manchester 1995: 9). This is particularly problematic in urban populations where the transience of individuals is most anticipated. The under-representation of the disabled in the skeletal record may be due to the gravitation of disadvantaged individuals to urban centres where their remains have yet to be excavated (Waldron 2000: 43), owing to the collaboration of the various evidential biases discussed above (16.1.1.). Their presence in the skeletal record, if retrieved and identified, would skew the information about the live population, their presence perhaps being attributed to genetic factors as opposed to social determinants.

16.3. Data interpretation

A fragmentary approach has traditionally been adopted in the study of the human remains, with physical anthropology distinct as a discipline and isolated from the relevant texts, representations and demographic information available for the interpretation of complex societies. This disadvantage has been identified in the study of Roman Egypt (Scheidel 2001: xxii), and is equally applicable to ancient Egypt. Palaeopathologists have demonstrated a reluctance to relate their findings to the broader population and environmental issues, owing in part to the primarily scientific approach adopted and the restrictive nature of the samples, rendering extrapolations unreliable (Armelagos and Mills 1993: 5-6). The inherent biases and interpretation difficulties specific to each body of evidence have discouraged cross-disciplinary studies. A holistic and comparative approach is required if the evidential biases are to be assessed and the sources are to be utilised to their optimum levels. It is not only informative to study the evidence for disease in isolation, but also to construct hypothetical models, such as urbanisation in an ancient context (Chapter 10), to appreciate the potential impact of disease and injury upon a community or population.

16.3.1. *Evidential biases*

Funerary practice has dictated the nature of the sample of the human remains evidence available for study. Both mummified and skeletal data demonstrate advantages and limitations in the quality of information to be gleaned. In terms of the identification of diseases, the preservation of soft tissue potentially favours the

recognition of a wider range of conditions and provides a greater opportunity for accurate diagnosis, when compared with skeletal data. But this analysis is dependant upon the availability of specialised non-invasive techniques, such as CAT scans, X-rays or immunology (Waldron pers comm), systems that are unfortunately rarely available within Egypt. For mummies housed in University museums, such as at Manchester, where access to scientific analysis is available, the process of mummification as an elite prerogative has biased the results of research in favour of a greater understanding of diseases and injuries amongst this social minority.

Although the increasing demand for elite funerary rites permeated society over time, in the form of mummification and entombment, these processes remained predominantly within the scope of the royal and elite classes. Consequently, the human remains of the non-elite comprise skeletal material, limiting the range of identifiable diseases and injuries to those that leave skeletal indicators. To an extent it is possible to extrapolate information from the elite evidence where diseases detected have environmental sources that would favour cross strata involvement. Although the comparative prevalence between social groups remains obscure, studies have revealed, for example, that the elite, as a social sector, were not exempt from parasite infestation (Ruffer 1910; Contis and David 1996; David and Archbold 2000: 160), despite our expectation of their higher nutritional and environmental status.

16.3.2. *Biases inherent in the study of palaeopathology*

A fundamental dilemma confronts the study of palaeopathology whereby the historical nature of the evidence renders any testing of hypotheses unrealistic (Armelagos and Mills 1993: 7). The human remains data represents a moment in time, capturing elements of the physical status at the moment of death, and provides no indication of how this point in time relates to the natural history of disease. Palaeopathology lacks the advantage of clinical medicine where this process can be monitored and identified in a live patient (Rogers and Waldron 1995: 15). As an isolated body of evidence, the human remains evidence provides an incomplete picture where substantial sections of information remain incomprehensible.

16.3.2.1. *Survival biases that affect the successful interpretation of pathological changes*

Any attempt at an accurate interpretation of the human remains data is dependent upon the state of preservation of the sample, where any reduction in quality impacts directly upon analysis, diagnosis and identification of disease distribution (Roberts and Manchester 1995: 9). The data is predominantly incomplete as a result of funerary procedures, subsequent deterioration and damage, and excavation techniques. Entire skeletons are vital for the reliability in diagnoses (Rogers and Waldron 1995: 8-9); the more comprehensive the skeleton, the greater the possibility of identifying pathological alterations (Waldron 1987: 63), and for assessing the distribution of those changes (Rogers *et al* 1987: 183). This is particularly important for the identification of, for example, leprosy, where diagnosis relies upon the involvement of the hands and feet (Roberts 2000: 48). The lack of evidence for leprosy during Dynastic Egypt (Nunn 2001: 398) may reflect poor data survival or inadequate retrieval procedures, as opposed to absence of the disease itself. Detailed recovery can be facilitated by the presence of the palaeopathologist at the site to assess conditions and to advise on excavation technique (Waldron 1989: 71). Loss and damage can occur during and after burial and/or excavation. Signs of disease and injury are generally under-represented in the human remains record, a situation that may be partially due to the small samples available for study and/or error in extraction and interpreting the evidence (Waldron 2000: 31).

Although mummification has been beneficial for the survival of soft tissues, the actual process of mummification was evidentially destructive to the body during organ extraction (Ruffer 1921: 20-21). The intentional desiccation practised during mummification dehydrated the soft tissues rendering the recognition of pathology problematic (Ruffer 1921: 15), without careful re-hydration. The mummified remains themselves are often incomplete or even entirely absent (Filer 1995: 47) as x-rays of wrappings have demonstrated.

The skeletal remains of the non-elite are subject to destructive processes from sand, water, rodent and chemical action (Filer 1995: 27), and it is frequently troublesome to differentiate between the symptomatic presentation of sand erosion and pathology (Ruffer 1921: 157). Bone displaying pathological alteration is fragile and prone to

damage and disintegration during excavation (Roberts and Manchester 1995: 9), a situation that favours the successful retrieval of unaffected data. This poor survival of pathological examples results in further complications in the differentiation between pre- and post-mortem damage.

Teeth are well preserved within the archaeological record due to their durability and resistance against destructive processes (Hillson 1996: 294). Pathology, in terms of microwear, caries and abscess cavities, is readily identifiable and can provide information on dietary factors (Manchester 1983: 51; Hillson 1996: 294). The scope for the recognition of disease is naturally restricted to those that affect the teeth either directly, or non-specifically resulting in enamel hypoplasia irregularities.

16.3.2.2. *Interpretative biases*

The retrieval of evidence for disease from human remains is a complex process, vulnerable to error and misinterpretation at many levels. The broad spectrum of current scientific procedures including, for example; radiology, endoscopy, microbiology, immunohistochemistry, electron microscopy, dental studies, palaeoserology and DNA analysis do, however, provide the palaeopathologist with a comprehensive set of options for their investigations, if available and affordable (for example: Pääblo and di Rienzo 1993; Goudsmit *et al* 1993; Hedges and Sykes 1993; Hillson 1996; David 1997; David 2000: 375-383). All scientific processes are reliant upon the nature and standard of the sample and its thorough investigation, if the production of a likely interpretation is to be forthcoming. The non-standardisation of the classification of diagnoses make comparative studies impracticable (Buikstra *et al* 1993: 26), a situation further complicated by the limited chances of comparing like with like in terms of age, time period, or the state of preservation. The introduction of professional guidelines as an objective for the *Mummy Project* (David 1979; David and Archbold 2000: 23) may help to rectify this situation.

Diseases are grossly under-represented in the human remains evidence due to minimal bone involvement and complications with diagnosis (Waldron 2000: 42). Observed abnormalities may be the result of post-mortem decomposition or excavation procedures causing pseudopathology, confounding attempts to determine cases of actual pathology (Roberts and Manchester 1995: 10). Differentiation between ante-

and post-mortem change, in addition to the process of mummification replicating aspects of pathology, conspire to complicate the picture (Buikstra *et al* 1993: 26-27). Only a fraction of potential conditions leave a skeletal record (Cohen 1989: 106), and the minority that do are not consistent in their involvement (Waldron 2000: 38). The skeletal response to disease is analogous regardless of the originating condition (Cohen 1989: 106), making specific diagnosis complex and rendering an understanding of the location of the pathology vital for any appreciation of the possible causal factor.

Infectious diseases, for example appendicitis, meningitis and pneumonia (Manchester 1983: 35), frequent contributors to a high proportion of rapid deaths, leave little or no trace of the infection on the human remains. This situation makes it impossible to study the impact of these diseases upon the population from the human remains data alone (Waldron 1989: 61). The skeletal record tends to record the effects of chronic and long-standing infection often not directly responsible for the death of the individual (Ortner and Putschar 1985: 104), leaving a finite cause of death elusive (Roberts and Manchester 1995: 9). It is important not to be over-interpretative, attributing specific causal factors where the evidence is non-conclusive, in the avoidance of the introduction of unsubstantiated hypotheses (Rogers *et al* 1987: 193). Injuries are also under-represented in the human remains evidence. Soft tissue trauma is often disguised either because of successful healing or due to the absence of the soft tissue from the skeletal remains (Manchester 1983: 55). Fractures pose identification and interpretative challenges associated with the problematic distinction between peri- and post-mortem breaks. The age of fractures can only be determined when the break occurred close to the time of death (Roberts and Manchester 1995: 73) and the evidence for childhood fractures, if correct alignment has been maintained, has often disappeared by the time of death due to complete healing (Waldron 2000: 34).

To summarise, the members of the non-elite are grossly under-represented within the human remains data from ancient Egypt. This is due to a combination of factors including the complexities of cultural practices that determined the location of non-elite burial sites. Subsequent elitist professional preoccupations have further contributed to the dearth of knowledge. The majority of conditions, particularly infectious diseases resulting in rapid fatalities, leave little or no evidence in the human

remains. The identification of injuries and diseases is dependent upon skeletal involvement, preservation of soft tissue, or the success of scientific procedures where for example, immunology can isolate specific antibodies. Even if data were available for study, in the form of complete cemetery populations, the identification of the majority of injuries and diseases would remain illusive, due to the nature of the restrictions imposed by both the limitations of the source and the accessibility of palaeopathological expertise and equipment.

Section 3

Concluding section

Introduction

This section evaluates the findings from sections one and two. In the attempt to provide a balance between the information provided by the sources and the limitations imposed by the evidential biases, discussions detailing what can actually be stated about the health, injuries and diseases of the non-elite workforces have been posed. These results are presented in a systematic manner, summarising the sources according to their character: textual, artistic, archaeological and human remains.

An evaluation of the evidence in terms of the broader social implications of disadvantage is included, as society's attitude would dictate the fate of diseased and injured individuals. These issues are pivotal not only to our understanding as to why 'anomalies' were included amongst the artistic representations of the non-elite, but also as to the likely welfare of those individuals who, in reality, suffered from the range of diseases and conditions suggested by the sources in question.

Finally, the evidence is evaluated in terms of how the non-elite worker was perceived by society, crucial to the potential for the recognition of occupational health issues as salient concerns. As indicated in Chapter 1 (1.3.) historically, the appreciation of occupational health issues amongst non-elite workforces has been dependant upon their value as economic commodities. Whilst indubitably central to the practicality of achieving the monumental enterprises desired by the elite, the workforce in ancient Egypt may well have been viewed as an expendable resource.

Chapter 17

What the sources say about the health, injuries and diseases amongst the non-elite workforces of Dynastic Egypt

17.1. Evaluation of the sources in terms of non-elite health issues

17.1.1. *Textual evidence*

Despite the cultural environment that influenced all aspects of the documentary record, a number of texts are highly significant in their contribution to our comprehension of the health of the non-elite. Workforce issues were included, albeit distorted by ideological dictates, within the administrative documents relating to conditions and rations on quarrying and mining expeditions, exemption from conscripted duties and the isolated example of an absentee record from Deir el-Medina. References to domestic religion detailed aspects of misfortune and illness and represent the closest resemblance to the direct voice of the non-elite. Medical and magical texts catalogue a range of diseases and injuries that, notwithstanding multiple interpretative considerations, indicate the priorities and techniques integrated into a system of medical intervention. The understanding of these texts is subject to a combination of factors including the accident of survival, cultural and literacy restrictions within the ancient society and subsequent limitations in providing accurate translations and interpretations (Chapter 13). Despite these complications, the medical texts, in particular, provide the basis for our understanding of ancient Egyptian medicine.

The expedition and administrative texts relating to quarrying and construction activities and the mobilisation of corvée workforces indicate aspects of the logistics and hardships experienced by the individuals involved (Chapter 2). Allusions to non-elite issues are indirect but remain of value. Indications of health hazards and hardships can be surmised from the locations of specific expeditions, the numbers involved and supply details. The expedition texts suggest that whilst the number of participants varied, they were often substantial. Individuals would be at risk from dehydration when water sources in the desert were uncertain, malnutrition or starvation if supply routes were jeopardised, and diseases and injuries due to the close proximity of groups of workers and the nature of their occupational tasks. The texts

themselves make no specific reference to the potential health implications owing to disparate ideological agendas. Even the isolated instance where fatalities have been suggested, alternative translations are equally applicable and perhaps more likely (Chapter 2: 2.3.). The identification of body labels from the Old Kingdom, although their provenance is not known, perhaps indicate the realistic challenges confronting the non-elite whilst fulfilling occupational duties. The inclusion of physicians on expeditions certainly suggests the requirement for medical intervention, although the evidence for the nature of either the conditions experienced or the treatments offered remain elusive. Textual references, including Middle Kingdom quarry marks and papyrus Reisner I and II, detail the division of labour and suggest that individuals and groups were dedicated to specific activities within the construction process, circumstances most likely to increase the risk of repetitive strains from habitual movements and postures. The only concrete evidence for injuries whilst fulfilling occupational duties are included in the absentee list from Deir el-Medina, where reference is made to an eye injury, a scorpion sting and the possible indication of burnt hands and feet.

Texts relating to corvée commitments exemplify the role of the state in determining individual destiny, aspects of which are discussed below in relation to the broader social implications that determined non-elite health (17.3.). A number of texts relate specifically to the penalties for avoiding conscription duties. These include flogging, imprisonment and the enforcement of permanent labour, all of which options would have been detrimental to health in numerous ways.

Documentary evidence for aspects of domestic religion indicate the precautionary measures implemented to resist the onset of diseases and the response when misfortunes occurred (Chapter 3). The 'letters to the dead' (Chapter 3: 3.1.), despite uncertainties as to whether they pertain to the non-elite, indicate the perceived relationship between the actions of the dead and the fate of the living. This perception was likely to permeate the various sectors of society regardless of their ability to materialise their beliefs in the form of a literate response. Similarly, the *ȝh iḳr n Rʿ* stelae (Chapter 3: 3.2.) indicate the continuing significance of the dead within the living world. The amuletic decrees (Chapter 3: 3.3.) are detailed in their focus upon the dangers posed by animal bites and insect stings, in addition to diseases such as

leprosy and conditions including blindness. Dating to the New Kingdom and subsequent periods, they perhaps indicate an increased awareness of the importance of personal protection for individuals as 'official' religion became more remote from the needs of society. Most significantly the texts relating to domestic religion highlight the relationship between the gods and dead in perpetrating diseases and injuries. The New Kingdom stela of Neferabut (Chapter 3: 3.4.) identifies specifically the condition of blindness with divine punishment. This perception of external intervention as instrumental in the distribution of diseases and incidence of injuries would influence the ability to recognise the role of occupational activity in endangering health. Whilst concentrating on appeasing the gods, the true cause of affliction would be overlooked.

'Literary' and 'instructional' texts are particularly complex in their interpretation where their value as 'entertainment' and 'moralist' teachings naturally influences any reference to reality. A number of general observations can be made pertaining to the social aspects of misfortune and death (Chapter 4). Despite the influence of fate and *Maat* in controlling individual destinies, and the dictates of social cohesiveness in encouraging humility and honesty in the individual, both pragmatic responses to death and cynicism as to the effectiveness of the physical preparation for an Afterlife enter the record. It is difficult to assess how death was perceived amongst the non-elite, due to the paucity of evidence. Evidence that does exist suggests that opportunities in the Afterlife were likely to relate to their status as workers and their success in fulfilling their social role (17.3.1.).

The medical texts provide the basis for our understanding of ancient Egyptian medicine (Chapter 5). Naturally, there are interpretative limitations and the range of injuries and diseases indicated are subject to errors in understanding (Chapter 13: 13.3.). The compilation of the treatises and choice of subject matter indicate the focus of professional attention and the utilisation of the exclusive literary domain as a means of recording their observations. Whereas it might be expected that both factors pertain to an elite practice for an elite audience, the content of the Edwin Smith papyrus, in particular, with its catalogue of injuries, must reflect the condition of the sector of society active in hazardous and manually demanding pursuits. Indications of the relative frequency of incidents are supplied by the inclusion of cases classified as untreatable (Table 2: Appendix 1), observations surely based upon the expertise and

experience of the author of the text. The Edwin Smith papyrus details a range of sprains, fractures and tissue wounds (Table 1: Appendix 1) concordant with industrial or military injuries and may well have constituted a reference manual for those involved in implementing the treatments for injured parties. The composition of such a treatise suggests that injuries were common occurrences in occupational settings, compromising both the individual and the efficiency of the enterprise.

The diseases and conditions listed in the Ebers papyrus (Table 4: Appendix 1), in addition to the other medical texts, would reflect the concerns of all sectors of society. If composition were based upon the elite experience, the prevalence of the same conditions amongst the non-elite would in all probability be greater, where nutritional status and living and working environments were inferior and more challenging. Ascertaining whether the non-elite were in receipt of the treatments mentioned is more difficult to establish.

To summarise, the textual evidence for the non-elite workforces indicates an incongruity within ancient Egyptian society. Economic success and the materialisation of power depended upon the exploitation of a conscripted workforce. Conversely the Edwin Smith papyrus demonstrates the recognition of the necessity to address the health needs of those whose injuries were caused directly by the harsh reality of the duties they were enforced to fulfil.

17.1.2. *Artistic representational evidence*

The artistic representational evidence for non-elite workforces are confined to the funerary contexts of the elite sector of society, and their depictions are subject to a range of ideological and conventional restrictions (Chapter 14). The composition of both scenes and models pertaining to non-elite activities do, however, highlight a number of aspects concerning non-elite health. Unfortunately, the evidence for trauma in an occupational context is inconclusive (Chapter 6). The isolated examples that have been noted as informative are open to a range of interpretations. On balance, all that can be confidently concluded from the scenes in question, despite the complex discussions they provoke, is that protective eye applications were probably utilised to reduce irritation from the sun's glare. Although this is a valuable observation, as it indicates a proactive stance against the discomfort and incapacity

that the working environment afforded, it remains unsatisfactory in terms of the overall understanding of occupation-related trauma. The unusual depiction of the surgical procedure of circumcision (Chapter 6: 6.2.), although presumably pertaining to an elite individual, perhaps reflects a more pervasive practice, affecting the adolescent male from all sectors of society. Alternatively, the surgical treatment for paraphimosis provides a possible interpretation for the depiction, indicating a condition likely to affect the non-elite in greater numbers than elite individuals, due to their activities in desert environments.

Workers displaying anatomical abnormalities within tomb scenes provide a wealth of information regarding the potential diseases and conditions they experienced (Chapter 7). Of particular interest are the instances where specific anomalies appear to follow occupational patterns. These occurrences appear to support hypotheses regarding the occupational root for a number of diseases and conditions, where individuals were at risk as a direct result of their habitual tasks. The gardener in the tomb of Ipuy with his cervical hump, for example, suggests the manifestation of either a task-related bursa, or an environmental exposure to tuberculosis (Chapter 7: 7.1.1.). The isolated inclusion of a hunchback gardener leads me to suspect that his affliction was not occupation-related, as, if the artist associated the two phenomena together indicating that bursae were common complications of gardening, additional examples would be expected. More determined in an occupational association are the depictions of *genu recurvatum* (Chapter 7: 7.1.2.) where deformity due to either trauma or bovine tuberculosis relate to the role of the herdsman and his duties. Even more convincing are the scenes including individuals displaying the characteristics of what was later denoted 'Egyptian splenomegaly' (Chapter 7: 7.1.3.). Although caution has to be exercised in attributing specific diseases to the physical symptoms depicted, schistosomiasis appears to be the most likely alternative. The manifestation of the indications of advanced schistosomiasis is included amongst individuals engaged in reed gathering, sailing, fishing and netting; all occupations that would expose the candidate to repeated infestation with the schistosomiasis parasite. The artist, in depicting the 'typical' aspects of the occupation, inadvertently supplies us with information upon the health status of the non-elite sector of society.

Artistic representations also indicate instances where 'disadvantage' predetermines the choice of occupation. Examples exist where blindness correlates with musical activities and dwarfism is associated with a variety of tasks including that of jeweller and servant (Chapter 7: 7.2.). These scenes, if corresponding to reality, indicate a level of social acceptance that determined the provision of succinct roles for specific disabilities. The evidence does not provide an indication of the prevalence of abnormalities amongst non-elite workforces, as the depictions relate more to the uncertain phenomenon of aspects the artists considered as 'typical' within the context of specific occupations. The wider social implications of disadvantage are discussed below (17.2.).

The inconsistency demonstrated by the occasional depiction of examples of protective equipment (Chapter 8) is perhaps similar to the reasons behind the inclusion or exclusion of anatomical abnormalities regardless of actual prevalence. These reasons remain elusive, but the rare examples do indicate, for example, that heat protection was utilised when handling crucibles, and that archers wore wristbands to avoid friction burns. The artistic representations of occupations in process also provide indirect indications of the likely health hazards involved (Chapter 9). Injuries and conditions would have been specific to each occupation depending upon the associated technology, posture, actions and environment.

17.1.3. *Archaeological evidence*

Studies of settlement sites to ascertain an insight into the living conditions for non-elite individuals are rare. Indeed, settlement sites themselves are under-represented in the archaeological record (Chapter 10: 10.1.). Those that have been excavated are subject to a range of theoretical and physical limitations to their interpretation (Chapter 15). Despite the paucity of evidence, certain characteristics emerge as common to a number of sites, including those with specific state functions and those demonstrating a range of domestic occupations. Housing for the non-elite was invariably comprised of small, compact units, poorly ventilated and overcrowded. Although population figures for individual settlements remain conjectural (Chapter 10: 10.4.1.1.), restrictions in domestic space were likely to feature in daily life. Domestic industries and animal habitations were frequently accommodated within the

domestic setting. These factors, in addition to populous housing units, would facilitate the spread of infectious diseases between the occupants.

Sanitation arrangements at settlement sites appear to have been haphazard if existing at all, although this may be due to incomplete analysis, and future excavations may reveal designated sites for the disposal of human waste (Chapter 10: 10.4.1.2.). Inadequate sanitation arrangements contribute to parasitic infestation and bacterial infection and the latter would have accounted for the high infant mortality and low life expectancy characteristic of these ancient communities. Parasitic infestation, endemic from contaminated water supplies would predispose individuals to anaemia and a consequent reduction in immunity to other diseases. Urbanisation would exacerbate both infestation and infections, where a common water source provided the opportunity to contaminate the whole community. The evidence from Giza and Amarna, for example, indicates a system of street drainage, but the accumulation of refuse within buildings and unoccupied sections of the site would encourage vermin and their allied diseases. It is likely that eye diseases and in particular trachoma were prevalent from this cause.

The ability to resist the onset of disease depended in part upon the nutritional status of the individuals and the community. Particularly important are protein levels in the diet. The faunal evidence from Giza and Kom Rabiʿa suggests a diversity of protein sources (Chapter 10: 10.5.3.), although, without the evidence for population levels, the actual proportion within the diet cannot be established. Similarly, it is not possible to establish ration quotas at, for example Semna, where both the sizes of the ration and the population are unsubstantiated (Kemp 1989: 177). On balance, urbanisation would be expected to increase the diversity of food products available, where interchanges could take place and storage could be facilitated, providing the population with protection against famine.

Overall, an urban existence, as opposed to a rural one, would exacerbate the prevalence of infectious diseases resulting from the proximity to a greater number of individuals. Particularly hazardous was the relocation of temporary or corvéed workforces into urban environments, where the transmission of infectious diseases and the likelihood of epidemics was increased. The transient community would leave

no facility for the development of 'herd immunity', an advantage associated with settled urban centres. Conversely, the concentration of the population within an urban settlement would encourage the development of a system to deal with the propensity of diseases experienced and might even facilitate the support of disadvantaged members within its social framework (17.2.).

The archaeological evidence for occupational settings, specifically those analogous with pyramid construction (Chapter 11), imply a range of health implications associated with the tasks involved. Hazards would include cuts, fractures, sprains and dehydration, in addition to the longer-term implications of, for example, silicosis, repetitive strains and skeletal changes. On balance, the occupational activities particularly relevant to corvéed workforces would have been detrimental to health both immediately, in terms of injuries sustained, and subsequently, due to enforced urbanisation and challenging working environments.

17.1.4. *Human remains evidence*

The evidence for the non-elite, diseases and injuries are under-represented in the human remains sources (Chapter 16). Despite this unpromising start, the limited and unrepresentative sample available for analysis, comprising mainly elite material, confirms a direct conflict between reality and the ideal life portrayed by the artistic and textual sources (Strouhal 1995: 13; David and Archbold 2000: 170). Studies have indicated that chronic ill health and anaemia, due to parasite infestation, were prominent factors so prevalent as to suggest a resultant depletion in energy levels incompatible with any quality of life (Winkler and Wilfing 1991; David and Archbold 2000: 173). The evidential disparity between the concept of the ideal life and the actuality indicated by the human remains, is likely to originate from the complex cultural biases imposed upon the historical record, and the wider social implications of disease and ill health. Our cultural environment and expectations demand a widely disparate standard of physical condition. It is likely that the contrast between the ancient artistic record and the physical evidence demonstrated an acknowledgement that perceived perfection was desirable although unattainable.

From the sets of 'less-elite' and 'non-elite' data that have been identified (Chapter 12), a number of observations can be made. Nutritional status, where quantified,

suggests that in common with the elite data mentioned above, a number of deficiencies attributable to parasite infestation and/or malnutrition have been noted. Resultant anaemia would reduce both physical stamina and the capability to resist disease. Dental pathology from the Giza samples records the dietary deficiencies and sickness crises during childhood (Chapter 12: 12.2.), factors active in contributing to a high infant mortality rate. A high prevalence of joint disease amongst the adult samples from Giza, Abydos and the Maya shaft at Saqqara suggest that skeletal changes were endemic throughout the group, independent of occupational activity. These changes are likely to reflect the habitual postures and carrying methods adopted throughout life, as a result of domestic in addition to occupational activities.

The evidence for medical intervention is significant in promoting a greater understanding of the methods adopted by society to cope with health issues. The human remains sources fail to contribute greatly to this appreciation, and the isolated instances of, for example, the successful reduction of fractures, survival of amputees and those with congenital abnormalities and debilitating tumours, may constitute insufficient evidence to equate to a systematic handling of disabilities.

17.2. Evaluation of the sources in terms of the social implications of disadvantage

The limited human remains evidence and the reconstruction of working and living environments has highlighted the diversity of diseases and injuries that would have plagued both the elite and non-elite members of society. A proportion of these diseases and injuries would have been physically apparent in the form of anatomical abnormalities. Chapter 7 has set out examples of tomb scenes where non-elite workers display physical anomalies. Their inclusion raises questions as to their significance in terms of the social acceptance of the disadvantaged and society's attitude towards disease. It might be expected that abnormalities would be reproduced in the depiction of workers to correspond more accurately with reality and to reinforce social distinction. Art can be an expressive medium for the conveyance of social comment; the 'wisdom texts' in ancient Egypt appear to fulfil a similar role, but the funerary context may not have been an appropriate environment for comparable artistic messages. Although ideological and cultural influences were significant, the inconsistency of the inclusion of physical abnormalities requires a more detailed examination of the function and interpretation of these representations.

If the Afterlife were to represent the advantageous aspects of this life, then it would be expected that all abnormalities would be omitted and that even the lower social groups would appear free from debilitating illnesses. There are three significant explanations for their inclusion:

- Abnormalities were accepted by society to such a degree that any negative association was overlooked. That is, abnormalities were either not associated with disease or inferiority, or were fully integrated. (17.2.1.)
- Physical characteristics were so inherent within sectors of society or amongst the workforces of particular tasks that they were included in representations as simple attributes rather than anomalies. That is, our classification of abnormal is meaningless in a situation with such a high prevalence of deviation. (17.2.2.)
- The inclusion of abnormalities amongst the lower social classes, and the exclusion of any defects in the representation of the elite, served to emphasise the disparity between the social sectors. (17.2.3.)

17.2.1. *Society's attitudes towards abnormalities*

The preoccupation with the ideal, demonstrated through funerary art appears to conflict with the approach of the ancient Egyptians towards physical abnormalities in reality. A complex attitude is demonstrated whereby individuals presenting physical 'difference' were not automatically excluded from society. The inclusion of abnormalities in representation may reinforce this positive attitude (Jeffreys and Tait 2000: 91), perpetuating the concept of *Maat* in a funerary context. Dwarfs in particular were associated iconographically with the occupations of jewellers, personal attendants and animal tenders and frequently occupied positions amongst the elite (Dasen 1993; Jeffreys and Tait 2000: 88-89). The god Bes adopted the appearance of a dwarf, playing a protective role during childbirth (Quirke 1992: 108) and reinforcing the positive symbolic concept of this form of disability. The social distinction suggested by the terminology for dwarfism (Weeks 1979: 73), if correctly interpreted (Chapter 13: 13.3.), would imply that social differentiation, as a method of categorisation, took precedence over deformity.

The practice of infant exposure can provide an indication of intolerance within society towards disability. There is no evidence, to date, for abandonment from ancient Egypt (Dasen 1993: 99), in fact, the human remains evidence from Deir el-Medina includes instances of disabled infants surviving beyond birth and being subject to careful burial procedures (Meskell 1999: 171). The absence of systematic cemetery excavation and the poor survival of infant skeletal material may mask the true situation. The human remains evidence from the 'workers' cemetery at Giza indicates two cases of healed amputations. The survival of these two individuals must be due, to some extent, to the support of their community during convalescence and their subsequent dependant lives (Chapter 12: 12.4.).

Staffs, as walking aids, were depicted as a symbol of authority in addition to a sign of old age and disability (Loebl and Nunn 1997). It is possible that the disabled and infirm condition was positively endorsed. Staffs were frequently represented in association with outdoor occupations (Harpur 1987: 128) and to differentiate between the overseer and the workers (Harpur 1987: 170). Their inclusion may simply represent a practical detail. The Pyramid texts include the following statement with reference to the four sons of Horus: '...who live by *Maat*, who lean on their staffs, who watch over Upper Egypt.' (Lichtheim 1992: 16). The notion of the staff in association with authority and an administrative role, as opposed to a symbol of disability, is thus further affirmed. This association with seniority of rank and age possibly accentuated the concept of having earned a disability through a dutiful life of hard work.

Musicians, and in particular harpists, were depicted blind. Occasionally a blindfold was used (Manniche 1991: 100), as if a 'seeing' musician would detract from the overall significance of the scene (Chapter 7: 7.2.1.). The fact that abnormalities or deformities were depicted in association with active employment indicates a positive attitude within the community. It is not possible to differentiate between attitudes towards congenital and acquired conditions as suggested by Jeffreys and Tait (2000: 91), as there is no evidence to suggest that the ancient Egyptians made a distinction themselves and both sets of circumstances were represented in funerary contexts. Confusion has been caused by for example, the iconographic convention that dictated the small size of minor figures in relation to the elite tomb owner, masking the

representation of acquired or proportionate dwarfism (Dasen 1993: 36). Achondroplasia with its disproportionate limbs is simpler to identify in the scenes and potentially distorts the record in favour of congenital dwarfism.

17.2.2. *The prevalence of abnormalities*

Characteristics were included to enable the occupation of the individual to be more easily recognisable (Weeks 1984: 100). The inclusion of anatomical abnormalities in association with specific occupations acquired an importance in this process of clarification. Schäfer (1986: 160-162) discusses this concept of the association of ideas in representation. He uses the example of a depiction of cobblers at work. Equipment and partly completed sandals were illustrated in front of and above the workers. Their positioning was unimportant as their significance relates to their association with the occupation. It is possible that defects were not considered to be 'abnormal' but were defining features of the typical people who fulfilled specific social or occupational roles. For this to be the case, it would be expected that occupational groups predominantly demonstrated these physical anomalies. Abnormalities would thus be viewed as generalisations of occupation-related phenomena and not as a record of specific individuals (Weeks 1984: 111). For example, if a proportion of fishermen were depicted with the visible signs of schistosomiasis (specifically abdominal distension and genital hypertrophy), it was because the artists had observed that, generally, fishermen displayed these symptoms. The artist would be clarifying their role and occupation by the inclusion of these details and representing what was, to the artist, significant about the subject. The artist was also, unwittingly, recording the existence of possible occupation-related abnormalities and disease. The human remains, ethnographic evidence and the hypothetical reconstruction of living and working conditions in ancient Egypt suggests that the majority of the population would have been infested with schistosomiasis. This condition is only recognisable physically, except by the sufferer, in the advanced stages of infestation. This manifestation of symptoms, in the form of abdominal distension and genital hypertrophy, was depicted amongst groups of workers continually subject to infestation due to their water-based occupations, possibly indicating the physical symptoms of the disease progression at an earlier stage in life (Chapter 7: 7.1.3.).

Even if the artistic record were complete, it would not be possible to predict the actual prevalence of disease for obvious reasons. These include the nature of the representations and the inclusion of abnormalities as discussed, in addition to the problems associated with attributing the symptoms portrayed with any one of the numerous possible diseases. The representations of abnormalities are only useful in ascertaining discussion points from which diagnoses and social implications can be hypothesised.

The categorisation of abnormalities in an ancient Egyptian context is problematic. There is no evidence to suggest that classifications followed definable parameters (Weeks 1979: 63), although the Edwin Smith papyrus did attempt to organise cases of injuries in descending anatomical order. The artists were not depicting an individual with symptoms of a specific disease, they were reproducing a mental image formed by what was significant in observed reality. In a way this provides a more reliable source, as it was not interpreted by the artist, but simply reproduced. It is left to us to attempt a classification of the diagnosis of particular ailments.

17.2.3. *Emphasis of social differentiation*

Abnormalities included in the representations of the non-elite may have been a device utilised to contrast and distance the idealised elite. Diseases may have been considered to be specific to the non-elite and thus a social determinative. Emaciation, in particular, would highlight the disparity of the provision for the elite and non-elite in a funerary context (Fischer 1959: 251). Obesity was depicted in association with more privileged positions including scribal and musical professions where access to the elite formed a significant part of the role. It may have been utilised as an indicator of wealth and success, presenting an alternative 'ideal' to the fit and healthy (Harpur 1987: 131). This may, however, be a record of fact when considering the inactive natures of these professions. A greater consistency in the prevalence of abnormalities would be expected to provide a meaningful comparison.

Weeks (1984: 144) has identified the importance of genetic propensity towards disease and abnormalities, in a society where occupations were frequently handed down from father to son. We could be witnessing the physical results of 'occupationally endogenous marriage' (Weeks 1984: 145). This is particularly

appropriate in cases of dwarfism. Familial relationships may have been represented by the inclusion of congenital abnormalities. Harpur (1987: 22-26) has observed a similarity in tomb scene style and content between family members during the Old Kingdom. This could simply be due to consistency in workmanship. Not all the symptoms depicted possess congenital causative factors, leaving the opportunity for occupational influences open.

To summarise, the reasons for the inclusion of abnormalities amongst workers depicted in tomb scenes remains elusive. It is likely that the artist was reproducing common images, although it is surprising that examples are rare. Their incorporation as determining factors of specific occupations would clarify the individual within their role and serve to distinguish them both from other occupational positions in addition to more elite sectors of society. It would appear that the social response to, for example, blindness and dwarfism was positive, where individuals were incorporated into specific occupational roles. The degree of acceptance evident for other physical disabilities is more difficult to ascertain, but less favourable reactions would be expected where any condition was considered to be, rightly or wrongly, contagious.

17.3. Evaluation of the sources in terms of their contribution to our understanding of how the non-elite were perceived within society and whether their health issues prompted broader social consideration

Ancient Egyptian sources demonstrate a range of limitations that restrict the scope of documented information featuring both the non-elite workforces and issues surrounding health, injury and disease. Crucial factors include the exclusive nature of the sources in question, the social and cultural dynamics that determined the elite perspective of the less advantaged, and the role of the non-elite within society. In addition, cultural and religious attitudes dictated perceptions of disease, indicating a reluctance to acknowledge disadvantage within the formal concept of an idealistically ordered world.

17.3.1. *Factors contributing to the exclusion of the non-elite from the historical and archaeological records*

The social and cultural dynamics of ancient Egypt conspired to exclude the non-elite from the evidential sources. Our ability to retrieve information pertaining to the non-elite individual is linked to their access to the media for recording indications of personal expression. For examples to have survived in the archaeological record, investment in the material culture of documentary, artistic or archaeological sources was required.

The issue of literacy is central to the appreciation of the evidential and cultural biases that restrict the documentary record for the non-elite, both in terms of direct access and content (Chapter 13: 13.3.2.). The non-elite were *de facto* illiterate (Baines 1983; O'Connor 1997: 14), in a society where literacy circumscribed broader social divisions (Parkinson 1991: 18). Documents were composed, written and read by a minority, and the opportunity for non-elite personal expression through textual media was severely hampered. Comparable to the incorporation of artistic references to the workforce in a funerary context, textual allusion was endorsed by an elite perspective, and was both incidental and the result of ideologically motivated conventions. Minority perceptions predominate and the evidence for the personal presentation of non-elite issues is confined to a few potentially unrepresentative examples (Chapter 3).

Funerary architecture, autobiographies and tomb decorations, despite being subject to ideological and religious conventions, are amongst the most explicit representations of relative status and personal expression that survive from ancient Egypt. Most significant to the under-representation of the non-elite in the funerary record were the cultural dynamics that determined the location and nature of non-elite funerary provision (Chapter 16: 16.1.1.). Although it is unlikely that the surviving archaeological record for tomb architecture and artefacts facilitates a comprehensive appreciation of provision, where symbolic and ideological influences promote interpretative misunderstandings, the evidence indubitably suggests that tangible preparations were an elite prerogative. Perhaps examples of offering stelae and the isolated instance of a model granary from the Middle Kingdom, in identifying the workers involved, served as an holistic incorporation of specific household members

due to their occupational and social role (Bourriau 1988: 105). Unfortunately, the majority of funerary models, in common with tomb scenes incorporating depictions of workers include no further examples of this personalisation. Despite the relaxation in the royal exclusivity of funerary provision apparent as the Dynastic period progressed, the preservation of the hierarchical prerogative that favoured both status and wealth persisted (Finnestad 1989b: 89). If, as might be anticipated, the tomb constructions that potentially took a lifetime to complete were considered critical for a successful Afterlife, the non-elite were effectively excluded from a provision indispensable to the ancient Egyptian religious consciousness. Of course, ancient Egypt was not unique in imposing elitist restrictions upon access to an Afterlife. Much more recently, the Anatomy Act of 1832 in Britain condemned the poor to physical dissection, a process that countered the perceived requisite complete Christian burial, ostensibly denying their subsequent access to heaven (Richardson 1987: 76; 121). The value in social advancement achieved by an increase in surgical knowledge outweighed any objections.

There can be little doubt that the non-elite in both ancient Egypt and 19th Century Britain aspired to attaining the elite advantages that were denied on grounds of status. The New Kingdom tombs at Deir el-Medina aptly indicate the desire to imitate the elite where raw materials and expertise were readily available (Chapter 1: 1.2.1.). This performance perhaps demonstrated abatement in the rigid social stratification of funerary activity characteristic of the Old and Middle Kingdoms, in addition to a pervading conviction that physical funerary provision constituted a wise investment for the Afterlife. The Third Intermediate Period witnessed a retraction in the practice of elaborate preparations for an Afterlife (Aston 1999: 63), perhaps out of necessity, as a result of the absence of royal provision. Also recognised was the significance of particular locations, such as Tanis or Sais, perhaps indicating an underlying preference previously masked by the focus upon elite grandiose structures. Textual evidence from scribal exercises suggests a suspicion about the uncertainty in the durability of funerary architecture, recommending reliance upon literary achievements to ensure immortality (Lichtheim 1976: 177; Chapter 4: 4.2.). The nature of these particular texts incorporated a bias in favour of promoting success within the profession, but perhaps also reflect an underlying concern in the efficacy of physical funerary provision.

What is not apparent from the archaeological evidence, but is illustrated by textual references, was the all-inclusive social dynamic that proclaimed the pharaoh as the representative of the whole community and designated the role and function of the individual (Finnestad 1989b: 91; Hornung 1992: 145). This concept of a social balance derived from the interaction of each sector of the community in performing their tasks was central to the concept of *Maat* (Chapter 4: 4.1.). The inclusion of the non-elite in the Afterlife was more likely to depend upon their success in maintaining *Maat*, and more specifically upon their moral behaviour (Baines 1991: 151), in the absence of the means to the tangible expression of funerary ideology. What is certainly apparent is that the cultural biases that restricted access to funerary arrangements have impacted upon our ability to recognise the non-elite individual through the cemetery record.

The exclusivity characterising formal religious practice, in addition to funerary provision, perhaps conducted the non-elite into a more secular life-style by default (Kemp 1995a: 26). Restricted access denoted broader implications including the distribution of power and the demarcation of social divisions (Baines 1990b: 22). Specifically during the New Kingdom, the non-elite were directly involved with the temple economy, but largely excluded from rituals, resulting in the development of public exhibitions, including the 'festival of the valley' that mimicked aspects of state ideology (Spalinger 1998: 250-251). This innovative inclination perhaps also resulted in the development or perpetuation of 'domestic religion' noted amongst New Kingdom textual references (Chapter 3), providing an insight into non-elite issues that a more inclusive formal religion might have eliminated.

The balance of evidence indubitably suggests a cultural divide between the sectors of society that dictated their relative status, defined their occupational and social role and facilitated their access to the media facilitating personal expression. Middle Kingdom texts demonstrate individuality in terms of prescribed ethical lifestyles and personal conduct that, contrary to suggestions that the non-elite emerged as voice with increased status during this period, perhaps simply indicate the writing down of memoirs (Parkinson 2002: 65-66). Likewise, the Intermediate Periods and the New Kingdom witnessed an emergence of the less elite individual in the documentary and funerary sources which may have been a natural result of the lack of central authority

(Parkinson 1991: 8). In addition, the increased access to literary expression masked the true extent of any change in levels of social interaction (Parkinson 2002: 64; 66). However, illiteracy and exclusivity continued to dominate the record, distorting a realistic impression of non-elite issues. Indications of changes and development over time should not be mistaken for the effects of evidential survival biases, where isolated examples from a broad time spectrum form the basis for interpretation.

17.3.2. Bureaucratic control and the non-elite worker

The overall impression conveyed by the evidence for the organisation of ancient Egyptian society is one of order within a strict and pyramidal, hierarchical system (Kemp 1989: 51). The social and economic cohesion is demonstrated by ambitious architectural achievements and by the central role designated to the royal funerary cult, characteristics perpetuated to a greater or lesser extent throughout the Dynastic history of Egypt (Kemp 1983: 86-87). The bureaucracy required to maintain such a system was encapsulated, particularly during the Old Kingdom, by the elite mastabas at Giza and Saqqara (Brovarski 1999a: 38), providing tangible evidence for the state's control over both royal and elite funerary arrangements. Textual and archaeological sources indicate the bureaucratic nature of society, although this stratification should not be permitted to disguise the complexity and potential diversity of each level of society more likely to reflect reality (Kemp 1989: 157; Richards 1997: 36).

Three principal tiers of society can be identified: the pharaoh and associated family and courtiers, the administrative elite, attested by complex titles (Fischer 1985) and tombs, and the majority of the populace, referred to indirectly in textual and artistic media and occasionally directly through the archaeological record. Non-royal members of society were thus either administrators or producers (Eyre 1987b: 211) and the social divide between them was wide but not insurmountable. Scribes demonstrated the value of a superior education in transforming a worker into a member of the administrative and literate elite. Producers were further divided into master craftsmen, who could aspire to the possession of their own tombs (as indicated by a sector of the community at Deir el-Medina), and the unskilled labourers. Administrative documents indicate a sophisticated attention to detail, supporting an ordered system in, for example, food rations and temple expenditure (Kemp 1972b; 1989: 125-128), and settlement data upholds the theory of a divided and stratified

society (for example: Kemp 1989: 149-157; Shaw 1992). It is important to appreciate that the divisive categories attributed to groups within society, referred to in the documentation, were elite definitions and there is no evidence to suggest that the workers considered themselves strictly segregated and ranked. The archaeological evidence from the workers' settlement at Giza demonstrates little differentiation between the various industrial installations and their associated domestic arrangements (Chapter 10: 10.3.1.). Their layout was, however, dictated by state planning, and hence may once again reflect how the elite perceived the workforce as opposed to a demonstration of their own concepts.

It is, perhaps, misleading to ascribe strict social or occupational distinctions, especially to the evidentially under-represented workforces, where a greater fluidity amongst the labour force as a whole may have existed. For example, Meskell (1999: 144-147), in her evaluation of the workers' burials at Deir el-Medina has observed distinctions in the mode of burial between different members of the same family. As would be anticipated, women, children and adolescents appear to have been assigned poorer funerary arrangements, indicating that age at death, in addition to gender may have been significant factors in dictating burial status, as opposed to simply social or occupational position (Meskell 1999: 169; Chapter 12: 12.1.4.).

There are a number of very clear indications as to how the bureaucratic system affected the non-elite in terms of enforced labour (Chapter 2), but how it related to their existence and social integration when not directly conscripted is less apparent. The Intermediate Periods may well provide an insight into the chaotic undercurrent that was disguised by the elite veneer, during times of central control (Lehner 2000c: 277). There has been a tendency, amongst scholars, to view these eras as interruptions to the continuum of focused authority, overlooking their potential as indicators of broader social issues (Wenke 1997: 117). The Intermediate Periods must have provided significant opportunities for the individual, perhaps most aptly demonstrated by the assertion of an increasingly direct relationship with the gods (Borghouts 1982: 5-6), the rise in the number of autobiographies (Brovarski 1999b: 45), and the cessation of state organised expeditions (Bietak 1999: 54).

Accommodation and funerary arrangements, although subject to interpretative distortions, adequately demonstrate individuality amongst the elite. Even personal achievements were reflected in actual innovations (for example: Imhotep and the step pyramid), autobiographies and the range of titles denoting occupational duties (Kemp 1989: 105). Unfortunately, the appreciation of portraiture is hampered by ideological constraints that limited the artistic representation of the individual, by favouring attributes such as perceived perfection and serenity over personal characteristics (Assmann 1996: 65). The non-elite individual is more elusive, frequently being classified within their occupational role. This situation has prompted hypotheses about the concept of the personal as opposed to the 'undifferentiated mass' (Meskell 1999: 11). Certainly, the hierarchical conformity resulted in a focus upon the society as a whole over and above the identity of the individual (Quirke 1992: 133). The doctrine of 'divine kingship' exemplified the importance of a social role and function as a result of individual endeavours, in the maintenance of order and balance. The sectors within society and their associated members were thus ideologically symbiotic and united in the preservation of order (Chapter 4: 4.1.).

It is restrictive however, to consider that power ideology and its related social distinctions reduced the individual simply to an agent of role fulfilment (Meskell 1999: 128). The absence of evidence for individuality amongst the lower status population cannot be equated to the non-recognition of personal identity beyond occupation. Conversely, the role of the individual within personal relationships and social structure was key to the successful operation of a bureaucracy (Lehner 2000c: 280). In common with the social organisation demonstrated by early civilisations, kinship patterns were likely to have been instrumental in the formation of community networks (Trigger 1997: 139), and in establishing a framework of reciprocal responsibilities (Lloyd 1989: 120). The evidence suggests that the household was an important social unit that created its own range of dominant and subsidiary relationships with other households, creating a network throughout the community (Lehner 2000c: 279-280). This concept of the extended household is reflected in the complex ground plan of houses incorporating occupational units at, for example, Amarna (Eyre 1987b: 193; Chapter 10: 10.3.4.), and in the layout of tombs with subsidiary burials at, for example, Dashur, perhaps designated to less-elite household members (Seidlmayer pers comm). The social segregation demonstrated by the

archaeological evidence at Lahun and Giza perhaps reflects the organisation of a community temporarily separated from their 'extended households' for occupational reasons, dependant upon the state, representing the ultimate household, for provisioning in return for services rendered (Lehner 2000c: 294).

The textual evidence documenting circumstances where members of the community strove to influence their fate provides glimpses of the individual, although examples are limited to instances where state involvement was apparent (Baines 1999a: 11). Issues of greed appear to have outweighed the considerations for a successful Afterlife (Silverman 1995: 60) in persuading individuals to participate in tomb robberies (Peet 1930; Silverman 1995: 58-61). Those who avoided corvée duties (Parkinson 1991: 99-101), and organised strikes (Silverman 1995: 61) evaded social responsibility. The emergence of the individual in autobiographical writings during the First Intermediate Period, mentioned above, may indicate a reaction against central authority (Loprieno 1996: 546), and the evidence from New Kingdom Deir el-Medina confirms individualistic activities in tomb preparation and in attempts at social advancement (Meskell 1999: 140). These are, however, only isolated examples, emerging from disparate time periods, and insufficient for an appreciation of the role of the non-elite individual beyond occupational activity, or for an understanding of the potential changes in status and opportunity at the various periods throughout Dynastic history.

17.3.3. *Enforced labour and the non-elite worker*

Monumental construction and the kingship cult demonstrated the control achieved by a central authority over resources, including manpower (Baines 1995: 3). State enterprises were achieved with the labour of a conscripted or corvée workforce (Eyre 1987a: 18-20), enforcing sectors of the community to participate in irrigation, raw material procurement and construction activities, in addition to their agricultural duties. The expedition texts indicate that the manual labour force was selected from the non-elite sector of society (Chapter 2), where evidence for the involvement of the army and prisoners relates only to the New Kingdom (Eyre 1987b: 209-210; Redford 1999: 60). The majority of the 'recruits' comprised male, low status individuals (Eyre 1987a: 19; Chapter 2: 2.2.). The depiction of the transportation of a statue in the tomb of Djehutihotep at Deir el-Bersha shows just such a workforce in action (Newberry

1894b: pl.15; Chapter 9). Exemption decrees (For example: Dashur decrees. Goedicke 1967) indicate the presence of corvéed officials possibly fulfilling administrative roles, where only the wealthy and influential were sufficiently privileged to avoid their seasonal commitment (Lesko B. 1994: 39; Chapter 2). The very existence of compulsory conscription indicates that the non-elite was subject to constraints imposed by their social superiors. Significantly, ancient Egyptian iconography depicted bound lapwings as a symbolic representation of the enforced restraint exercised over the population by centralised control (O'Connor 1997: 14).

The utilisation of compulsory labour for state projects, incorporating a system of punishment for absconding, suggests a domineering attitude, concerned with the physical capabilities of the workforce, as opposed to any humanitarian understanding. It is tempting to deduce that the harsh nature of many of the conscripted duties necessitated an elite perspective that regarded the workforce as an economic resource. Traditionally adept at record keeping, the ancient Egyptians monitored their human resources in a practical manner, and this desire for detailed records should perhaps not be mistaken for a genuine interest in the individual.

Artistic and archaeological sources support the concept of an exploitative elite perspective. The methodical and sanitised version of occupational activities represented in a funerary context disregarded the frequently harsh and dangerous environments more realistically accredited by archaeological remains of examples of industrial settings (Chapter 11). Conforming to ideological dictates that defined the content of idealised tomb scenes, these representations perhaps also reflected the functional purpose of the tasks themselves, the significance of continuous supply superseding personal cost. It is possible that manpower resources were designated amongst the raw materials and provision requirements comprising vital components for the success of state-controlled projects. State-planned settlements, constructed to accommodate workforces employed on royal projects, demonstrate the architectural features of control and constraint (Lehner 2001b: 2), suggesting the exigency for persistent enforcement, required to overcome the unpopularity of the exercise. Alternatively, the concentration of supplies and raw materials, within the settlement, may have attracted unwelcome visitors, the controlling features designed to exclude as opposed to entrap.

17.3.4. *Non-elite health issues as broader social considerations*

The social and cultural dynamics must have supported and justified the labour regime by emphasising a sense of communal duty amongst the non-elite. The evidence suggests that the non-elite were offered little alternative but to comply with demands, in an ideological environment so socially intrinsic as to over-ride any suffering on the individual level. The majority of projects requiring mass labour forces focused upon quarrying and construction enterprises obligatory for the establishment of royal funerary complexes and temples, to perpetuate the concept of divine kingship. It could be said that both tangible manifestations of elite religious ideology excluded the non-elite once their construction was complete, unless the fulfilment of duty was, in itself, a guarantee of inclusion. It is difficult to perceive any willing participation by individuals without an anticipated reward. The disparity in funerary arrangements between the pharaoh, the elite and the non-elite was so marked that rather than accepting the huge social divide that it suggests, an alternative holistic view to an inclusive Afterlife, that favoured all who fulfilled their duty during life, might be more sustainable. Certainly, as mentioned above, the limited evidence for non-elite burials indicates that the inclusion of funerary goods anticipated an afterlife for the individual (Meskell 1999: 161). Evidence from a later demotic text suggests that a poor life and humble funeral did not necessarily equate to poverty in the Afterlife, and that a moral existence was perceived to be more valuable (Setne Khamwas and Si-osire. Lichtheim 1980: 139-140), although the Greek influence on the composition of this text is difficult to substantiate. Ideally, social order was maintained into the Afterlife, demonstrated by tomb illustrations, and indicating that if individuals were responsive to the needs of *Maat* in this life, then an inclusive Afterlife could be anticipated. Similar to women aspiring to eternity through the agency of their male relatives (Meskell 1999: 159), the workers were dependent upon the elite for their own spiritual future. An alternative more pragmatic suggestion for the co-operation in labour duties proposes land allocation in return for service to the state, rendering participation vital for survival (Eyre 1987b: 209).

The evidence for the practice of domestic religion demonstrates a pragmatic approach to misfortune on the part of the individual and the community (Chapter 3). Possibly in response to an acceptance of the incorporation of hazardous occupations within the non-elite social role, prophylactic protection in the form of amulets and decrees was

adopted to safeguard against the consequences of dangerous situations, injury and disease (Baines 1987: 84; Pinch 1994: 142-4). It would be expected that in a society where the numerous hazards of everyday life were identified and protected against, dangerous occupations would also feature as a threat to health. The use of amulets is, however, a long way from our understanding of preventative medicine and the recognition of occupational health issues, which requires a will to correct the situation and an organised approach in the introduction of safeguards for the workforce. It is perhaps misguided to seek for evidence that the workforce protected itself from injury in a form recognisable within our cultural framework. Although it might be surprising that the artistic representations of occupations demonstrate an inconsistency or absence of the use of protective equipment when, for example handling crucibles of molten metals, or during combat (Chapter 8), the ideological biases prohibit superficial interpretations. Rather than suggesting that the ancient Egyptians either made no connection between occupation and trauma or simply overlooked opportunities to improve their situation, perhaps the perceived benefits of amuletic protection are insufficiently appreciated.

The balance of evidence appears to indicate that the non-elite were viewed as a labour resource to be utilised in exchange for potential economic and ideological rewards. Although apparently inhumane when viewed from our modern standpoint, the ancient Egyptians were certainly not unique in their apparent exploitation of the non-elite. As outlined in chapter 1 (1.3.), historically the appreciation of occupational health coincided with the economic concerns caused by a debilitated workforce, with the humanitarian interest following subsequently. The health and welfare of individuals participating in ideologically and/or economically driven projects has been a low priority. In addition, any relationship between occupational activity and health has been overlooked, due to a combination of a deficient understanding of the aetiology of disease, and a lack of observation.

Edwards (1982: 115-116) observed a team of conscripted labourers working on a canal in the vicinity of Dendera in the late 19th Century. She recorded that the overseers were accommodated in tents and the workforce in open encampments. The labourers worked for three to four months on the project and were then released to find their own way home, often unsuccessfully. Of course direct comparisons cannot

be made, but it is interesting that enforced labour regimes were in operation in Egypt at this comparatively recent date. The archaeological evidence for the achievements of the ancient Egyptian workforces indicate that they must have experienced regular injuries and fatalities within the group. It would not be surprising, if in accordance with pre-industrial Europe, society dismissed these incidents as slightly regrettable, but necessary sacrifices to duty and the end result. Within this atmosphere of social order and enforced labour, it is scarcely surprising that the record for the non-elite including their accomplishments and misfortunes is so incomplete. Welfare considerations for participants would only have become issues when economic pressures required longevity rather than disposability.

The sources of evidence relating to the non-elite in ancient Egypt suggest a resource-based attitude towards the workforce. Combined with the cultural perspectives that dictated perceptions of health (Chapter 1: 1.4.), it can perhaps be surmised that although the obvious associations were made between labouring and physical hardship, the social dynamics and ideological incentives dominated the needs of the workforce.

Conclusions

The evidential biases that hamper our understanding of aspects of non-elite health issues are entrenched within ancient ideological and social concepts, as demonstrated by the incomplete and unrepresentative data. Our interpretation of the sources is restricted by practical limitations, in addition to our cultural subjectivity that overlies all attempts at establishing an understanding of differing conceptual processes. An appreciation of the physical conditions experienced by the non-elite workforces is significant to our understanding of the social and logistical background to the infrastructure involved in perpetuating state ideology. There are multiple explanations for the absence of any direct references to the workforces in the ancient record. This thesis has explored these reasons in detail and has demonstrated that it is insufficient to select isolated instances of, for example texts or representations, for the purpose of extrapolating information, without grounding interpretations within the ideological framework that dictated their content and reason for execution.

The accident of survival of evidence from ancient Egypt has favoured the preservation of information concerning the elite. This is partly due to the preoccupation with the creation of enduring monuments for the practice of elite religious ideology and for the perpetuation of funerary provision. This elite bias has resulted in the accessibility of information regarding many aspects of elite culture, in terms of religious, funerary, artistic and textual sources, but has also overshadowed the role and cultural attributes of the non-elite within society. The professional bias that has favoured elite achievements, notable within Egyptology, has arisen as a result of this overwhelming wealth of information. Recent attempts have been made to redress this balance, but it should not be underestimated to what extent the ancient elite bias has infiltrated many aspects of the ancient record, distorting our picture of the non-elite.

The individual sources provide conflicting evidence about the health of both the elite and non-elite. Whereas, for the elite, this was largely due to the attempts at creating an idealised image, for the non-elite, their manifestly co-operative and cohesive nature was promoted for political as well as ideological reasons. Immediately apparent is the disparity between the textual and artistic references to the non-elite and the likely reality demonstrated more aptly by the archaeological evidence and

limited human remains. This contrast is largely due to the elite dominion exercised over the literary and artistic media, dictating their perspective and content. The labour intensive and industrial activities pursued provided innumerable opportunities to incur injuries and task-related diseases (Table 5: Appendix 1). The living conditions demonstrated by the archaeological evidence would have subjected the occupants to a range of public health disorders (Chapter 10), and probably reflect a more widespread situation within urban settlements of the time. Initial impressions would lead one to surmise that the evidence for ill health amongst the non-elite is predominantly absent from the ancient record. The idealised format adopted for the majority of portrayals of the human figure in a funerary context is misleading if accepted on a superficial level, just as the politically motivated expedition texts suppress reality in favour of a description of the effortless success in providing resources for the state. These formal expressions of religious and political concepts cannot be considered as the most appropriate media for a description of the fate of the non-elite individual. The indicators are present however, in for example, the textual evidence for aspects of domestic religion, in the occasional deviation from the norm in the representation of anatomical abnormalities amongst the non-elite and in the identification of body labels for the record of fatalities on expeditions.

The social dynamics conspired to perpetuate the record of the elite and suppress references to lower social economic groups, both as a result of ideological dictates and due to the practical considerations of literacy. Although the evidence for the workforce is scarce, indirect and unrepresentative, it suggests a predominantly economic view of the workforce by the elite, with little recognition of individuality beyond practical function. Not surprisingly the evidence provided by the workers themselves, albeit limited, indicates a more holistic view comprising individuals interacting in family units within their community, where occupation comprised one, admittedly important, aspect of their lives. It is not possible to distinguish between an actual increase in the opportunities for personal expression during the New Kingdom from the bias imposed by survival and excavation biases. Given the nature of the evidence and its biases it would be expected that information regarding the health of the individual, especially a non-elite individual, would be difficult to access.

The record is further distorted by the perception of fate, the concept of the ideal and the avoidance of reference to misfortune in most formal contexts, whether documenting military incidents or expeditions. The medical papyri and less formal references to domestic religion provide a more comprehensive understanding of health concerns. The introduction of the negative aspects of life into politically significant or funerary environments was considered contrary to the portrayal of an idealised and controlled social setting, to be perpetuated throughout life and into the Afterlife. No one would suggest that misfortune, disease, injury and early death did not play a significant role in the lives of the entire community, and in particular the labouring workforces. The restricted access to literacy and a fatalistic attitude would contribute to the suppression of information regarding this situation, but isolated textual references indicate that the community was proactive in their attempts to avert misfortune (Chapter 3). It would appear that, although powerless to avoid the hazards inherent in the labouring duties imposed by the state, or during their daily occupations, the non-elite during the New Kingdom utilised a system of preventative spells and communications with the dead that were incorporated into their domestic religion.

The complex attitudes surrounding the understanding of diseases and injuries would be impossible to appreciate without the medical papyri. These texts constitute an invaluable source of evidence. They are useful not only in the elucidation of some of these concepts, but also as an indication of the range of ailments that concerned the population, including the lower social status groups, and the collective attempts to alleviate symptoms and prevent complications. It is important to appreciate that these documents were more likely to reflect the preoccupations or 'scientific' interests of the elite in addition to any endeavour to improve the lot of society (Chapter 5), and should not be interpreted as being entirely philanthropic. The labouring workforces would have provided an excellent environment for the practical observation of injuries, but it is not possible to distinguish between an economic or altruistic motivation behind the compilation of, for example, the Edwin Smith papyrus.

The evidential biases that distort the record for the artistic representation of the non-elite in a funerary context result in an unrepresentative and elitist view of this social category. Their depiction was dominated by ideological, iconographic and religious

conventions that constrain our attempts at gaining a realistic impression of the health of the non-elite (Chapter 14). Despite artistic conventions and the concept of the ideal form, physical abnormalities and disabilities were included, amongst the depictions of the non-elite, demonstrating a complex attitude towards physical 'difference' (Chapter 7; 17), and providing an insight into the conditions that were prevalent and possibly characteristic of specific occupations. It is not meaningful to quantify the materialisation of abnormalities, as the tomb scenes are non-representative as a sample, nor are the depictions of workers portrayals of specific individuals. It is impractical to suggest that the artists, in their representation of occupations in action with the numerous human figures involved, would be reproducing actual people, although the images of facial and physical characteristics would have been selected from a repertoire of personal experience. The presence of workers in tomb scenes could be seen as a necessity purely for demonstrating a procedure. Certain characteristics were incorporated, including; blindness, mode of dress, obesity, and dwarfism, which even if introduced as details to alleviate strict canonisation, still provide information on what the artist considered to be idiosyncratic.

Contrary to previous suggestions, there is no conclusive evidence for the artistic representation of occupational trauma (Chapter 6). In addition to the ideological constraints upon the documentation of misfortune, the need to produce an enduring image perhaps negated the inclusion of momentary incidents. In view of the depicted abnormalities, it would be misleading if conclusions relied entirely upon the positive identification of the diseases to which the depicted symptoms related. The possible causative factors include congenital abnormalities, genetic disposition and environmental and occupational factors. A proportion of the disabilities represented may have had occupational roots; for example emaciation as a result of bovine tuberculosis amongst herdsmen and abdominal distension probably denoting schistosomiasis amongst water-based occupations. The associations are striking in spite of our incomplete understanding of the reasons behind their inclusion.

The archaeological evidence for the living and working conditions specific to the non-elite is limited due to the survival and excavation biases that have restricted the opportunity to form a comprehensive appreciation of urban conditions (Chapter 15). The accident of survival has favoured the preservation of settlements associated with

royal projects, often located in more remote desert locations, whilst the majority of Nile-based urban centres remain unidentified, eroded or redeveloped and inaccessible. The elite bias traditionally adopted by Egyptologists has resulted in a corresponding lack of interest in the archaeology that relates to the non-elite. Attempts to redress the balance are now being made and the current excavations at, for example Giza and Kom Rabiᶜa (Chapter 10), provide an insight into the conditions experienced by the non-elite on society. The evidence is incomplete and theoretical models must necessarily be conjectural. It is possible, from our technically advanced position, to project our knowledge back onto the range of environmental conditions that the workers were exposed to and, where response is predictable, hypothesise about the impact in an ancient context. For example, it is safe to surmise that the accumulation of large populations of people, from differing geographical origins throughout Egypt, for participation in corvée duties, would have precipitated outbreaks of infectious diseases. Similarly, the close proximity between members of the workforce, demonstrated by the working and living environments at Giza, would have encouraged the spread of these diseases (Chapter 10). With infectious diseases rated as the greatest cause of premature fatality amongst pre-antibiotic societies, the human cost of corvée duty would have extended beyond the conditions of work.

The archaeological evidence for working environments is similarly scant and our knowledge relies heavily upon the existence of the products of labour in the form of constructions and artefacts (Table 5: Appendix 1). A comprehensive appreciation of methodology is often not possible through the creation of hypothetical models or even with the use of experimental archaeology. Too many aspects remain unknowable and cultural biases dictate differing standards of viability. No experiment is going to promote detrimental conditions amongst its participants to evaluate how long it takes to develop, for example, silicosis or squatting facets. In the absence of appropriate human remains evidence, hypothetical models of the health effects of any task, including that of pyramid building, although assumed to be detrimental in many ways, are impossible to substantiate (Chapter 11).

Not only are the non-elite predominantly absent from the human remains record, but the evidence for injury and disease is grossly under-represented in mummified and skeletal material (Chapter 12). This absence of evidence is partly due to ancient

funerary customs that have rendered the non-elite burials difficult to locate and subject to deterioration (Chapter 16). The research biases that have resulted in a concentration upon elite funerary excavations has retrieved human remains material often to be rejected in favour of more 'valuable' artefactual objects. The situation regarding the non-elite data will hopefully improve in the near future, with the publication of existing sources and the excavation of further sites. The dearth of data could be viewed as a sufficient obstacle in the appreciation of health issues even without the second category of under-representation, mentioned above, that refers to the identification of diseases and injuries from the human remains. The survival and interpretative biases result in a situation whereby the human remains evidence, if available, would be insufficient for a complete understanding of health without supporting evidence from additional sources. Many infectious diseases that would have devastated ancient populations leave no trace in the skeletal record and those that do are not consistent, and often cannot be differentiated from one another. Even the identification of injuries is problematic and the temptation to attribute occupational roots to degenerative diseases is positively misleading (Chapter 12: 12.3.).

Although not helpful in calculating the prevalence of diseases and injuries, the human remains evidence is informative about the potential range of conditions that existed within society and for the possible indication of medical intervention (Chapter 12: 12.4.). A catalogue of diseases and parasite infestations can be established with the use of the existing human remains material, which, when combined with our knowledge of the pattern of specific diseases hypotheses, can be posed, but not tested, about the impact upon the remaining sectors of society. The indications suggest that the non-elite would have suffered from extensive parasite infestations and chronic illnesses that together with nutritional deficiencies would have resulted in anaemia, and a corresponding reduction in the longevity and quality of life. Osteoarthritic changes to joints, although demonstrating a complex relationship with stress, indicate that there was a possibility that the manual component inherent in the lives of even the administrative classes was significant. The evidence for medical intervention from the human remains at Giza remains inconclusive, although it would appear that the facility for care and support of the maimed was apparent, as demonstrated by the survival of amputees amongst the administrative sector. Whether this luxury was

available to the non-elite, who relied entirely upon their physical capabilities to maintain their occupation, remains doubtful.

The evidence from the combination of sources appears to suggest that, as would be expected, the non-elite were disadvantaged in many ways. Their social position was legitimised and reinforced by the concept of *Maat* and collective responsibility. Conscripted labour duties imposed obligations upon the individual, separating them from their local environment, occupational activity and household units, with the risk of punishment if they absconded. The non-elite were excluded from opportunities for personal expression through the confines of illiteracy and from formal religion due to the elite monopoly over religious ideology. They were recipients of very basic funerary arrangements in a culture that viewed the provision for the Afterlife as supremely important. It would be difficult to imagine, within this cultural environment, that the non-elite were viewed in any alternative way than as a human resource to be utilised for the furtherance of the state, political and religious ideologies. Textual references reinforce the importance of role fulfilment throughout all levels of society, perhaps as a means of ensuring a place in the Afterlife, but there is little doubt that the non-elite jeopardised their health in fulfilling their roles. Whether this was considered to be a necessary or unavoidable price in a fatalistic atmosphere is difficult to assess. Certainly artistic representations are lacking in reference to many forms of the most basic protective equipment in their depictions of occupations in process, but the reasons for this are potentially numerous (Chapter 8). The Edwin Smith papyrus alone suggests that the human cost due to injury was a subject for consideration and documentation, indicating a proactive response to what must have been a significant aspect of constructional activities in particular.

Even within societies where detailed documentation included census material and death registration, biases still hamper a comprehensive appreciation of historical health issues due to differing definitions of the causes of death, demographic uncertainties and differing patterns of disease (for example: Roman Egypt. Scheidel 2001). It is not surprising that in the absence of such documentary evidence, the health of ancient Egypt's non-elite remains obscure. What is interesting is the way in which the evidential biases conspire to disguise this information. The human remains of the elite and royal members of society demonstrate the prevalence of parasites,

infections and diseases, and it can only be assumed that, with the additional hazards involved in manual labour, the non-elite fared no better. Documentary evidence suggests that the acknowledgement of occupations and their health implications has been dependent upon the social environment, the degree of medical advancement, the level of industrialisation and type of industry involved, and the organisation of the community as a whole. Health issues in relation to workforces have to be experienced, observed, monitored and communicated before conclusions can be drawn and action taken. The economical and cultural environment will dictate whether problem solving is prioritised or even attempted. The ancient Egyptian cultural complexity demonstrated by, for example, bureaucratic organisation and architectural achievements would lead to the anticipation of a capability in addressing health concerns. Perhaps the presence of physicians on expeditions and the Edwin Smith papyrus comprise isolated indications of a practical approach.

This thesis has demonstrated that the formation of a determinative description of non-elite health is impracticable. All that is possible is a balanced assessment of the information available, with constant awareness of the cultural and ideological environment that influenced all aspects of the record. The shift in academic interest towards less-elite activities and the social aspects of ancient Egyptian history will hopefully sustain and promote the excavation of settlement and non-elite cemetery sites. Every new body of evidence is vital in supporting or refuting hypotheses pertaining to aspects of non-elite existence that currently cannot be substantiated.

Appendix 1: Tables

Table 1: The Edwin Smith papyrus: the traumatic conditions (Breasted 1930)

Case	Type of trauma
1	Head injury penetrating to cranium
2	Gaping head injury penetrating to cranium
3	Gaping head injury perforating cranium
4	Gaping head injury splitting cranium
5	Gaping head injury with compound comminuted fracture of cranium
6	Gaping head injury with compound comminuted fracture of cranium and rupture of meninges
7	Gaping head injury penetrating cranium and perforating sutures
8	Compound comminuted fracture of cranium with no visible external injury
9	Frontal wound and compound comminuted fracture of the cranium
10	Gaping wound to upper orbital penetrating bone
11	Broken nose
12	Broken nose
13	Compound comminuted fracture to the nose
14	Tissue wound to side of nose penetrating nostril
15	Perforation of maxilla and zygoma bones
16	*Split to maxilla and zygoma bones*
17	Compound comminuted fracture to maxilla and zygoma bones
18	Tissue wound to temple
19	Perforation of temple
20	Head injury and perforation of temporal bone
21	Split to temporal bone
22	Compound comminuted fracture to temporal bone
23	Slit in outer ear
24	Fractured mandible
25	Dislocation of mandible
26	Wound to upper lip
27	Gaping wound to chin
28	Gaping wound to chin perforating oesophagus
29	Gaping wound to cervical vertebra
30	Sprain of cervical vertebra
31	Dislocation of cervical vertebra
32	Displacement of cervical vertebra
33	Crushed cervical vertebra
34	Dislocation of both clavicles
35	Fractured clavicle
36	Fractured humerus
37	Complicated fracture of humerus
38	Incomplete fracture of humerus
39	Tumours or ulcers on breast
40	Wound in the breast
41	Infected wound in the breast
42	Sprain of the sternocostal articulations
43	Dislocation of the sternocostal articulations
44	Fractured ribs
45	Bulging tumours in breast
46	Inflamed abscess on breast
47	Gaping wound to shoulder
48	Sprain to thoracic/ lumbar vertebrae

Table 2: The Edwin Smith papyrus: cases requiring or benefiting from no treatment (Breasted 1930: 429: 466)

Case	Condition detailed by case	Diagnosis: not to be treated	Treatment instructions omitted	Treatment listed despite unfavourable diagnosis
5	Gaping wound in the head with compound, comminuted fracture of the skull.	✓		✓
6	Gaping wound in the head with compound, comminuted fracture of the skull, and rupture of the meningeal membranes.	✓		✓
7ii	Gaping wound in the head penetrating to the bone and perforating the sutures. Possible tetanus.	✓	✓	
8i	Compound, comminuted fracture of the skull displaying no visible external injury.	✓		✓
8ii	Compound, comminuted fracture of the skull displaying no visible external injury, with bleeding from nostrils and ears and neck stiffness.	✓	✓	
13	Compound, comminuted fracture to the side of the nose.	✓	✓	
17	Compound, comminuted fracture of the bone in the region of the maxilla and zygoma.	✓		✓
20	Wound to the temple, perforating the bone.	✓		✓
22	Compound, comminuted fracture of the temporal bone.	✓	✓	
24	Fracture of the mandible.	✓	✓	
31	Dislocation of the cervical vertebra.	✓	✓	
33	Crushed cervical vertebra.	✓	✓	
34ii	Dislocation of the two clavicles.		✓	
37ii	Complicated fracture of the humerus.	✓	✓	
44	Fractured ribs.	✓	✓	
45	Bulging tumours on the breast.			✓
47iii	Gaping wound in the shoulder.		✓	

Table 3: The Edwin Smith papyrus: the incantations and recipes (Breasted 1930: 472-507)

Incant -ation	Disease/ misfortune	Perceived cause	Treatment constituents
1	Pest of the Year	Hostile demons, evil wind	Two vulture feathers and incantation
2	" " " "	Seasonal plague bearing wind, demons of disease, malignant spirits, messengers of Sekhmet	Stick of *ds* wood and incantation whilst walking around the outside of the house
3	" " " "	Men, gods, spirits and the dead	Incantation
4	" " " "	Passer-by	Incantation
5	" " " "	Male and female spirits and dead, animals 'The one which the crocodile has taken' 'The one which the serpent has stung Someone killed with a knife, or who died in bed Demons of disease All the above from Buto, *bsbs*-goose and asses	Repeat incantation over images of Sekhmet, Bastet, Osiris and Neheb-Kau. Write the words with *mrḥt* on linen and attach it to a man's throat.
6	Swallowing a fly	Fly	Incantation
7	Pest, specifically food and beds	Sekhmet, demons of disease, Bastet, breath	Incantation spoken over *nfrt*-flower bound to *ds*-wood with linen and passed over house contents.
8	Pest	Diseased ones	Incantation whilst holding a *šȝms*-flower
9	'Female troubles' (Amenorrhoea)	Obstruction of the vulva	Consume for 4 days cooked *wȝm*, grease and sweet beer. Local application of oil, *tpnnt*, eye-paint and sweet frankincense. Alternative application of *ḥḏrt*-ear ointment and incense.
10a/b	Improve complexion	- -	Anoint with natron, red natron and northern salt. Anoint with alabaster, natron, northern salt and honey.
11	Anti-ageing	-	Anoint with natron, red natron and northern salt. Anoint with alabaster, natron, northern salt and honey.
12	Ailments of the anus and associated area	-	Complex potion made from *ḥmȝyt*-fruit. Poultice of ground and cooked acacia leaves on fine linen.

Table 4: The Ebers papyrus: catalogue of cases (Ghalioungui 1987)

Cases	Category of ailment
1-3	Spells to accentuate the efficacy of medical treatments
4-103	Abdominal disorders including internal parasites
104-121	gsw ointment and its topical applications
122-182	Abdominal disorders and oral and anal applications
183-187	Thoracic disorders
188-218	Gastric disorders
219-220	Cardiac disorders
221-241	ʿ3ʿ disease (possibly schistosomiasis)
242-247	Intervention of gods in preparing treatments
248-250	Head disorders
251	Uses of dgm plant
252-260	Head disorders
261-283	Urinary tract disorders
284-293	Gastric disorders
294-300	št.t disease (possibly rheumatoid arthritis)
301-304	Miscellaneous of dubious translation
305-325	Upper respiratory disorders
326-335	gḥw disease (translation unclear)
336-417	Eye disorders
418	Nasal disorder
419-431	Eye disorders
432-436	Bites
437-450	Head disorders and external applications of ḥnsj.t
451-463	Recipes to avoid hair greying
464-476	Recipes to promote hair growth
477-481	Hepatic disorders
482-514	Burns
515-542	Wound treatments
543-550	ȝkw.t disease (translation unclear)
551-555	bnw.t disease (possibly inflammation of various soft tissues)
556-591	šfw.t swellings and limb tremors
592-602	Blood disorders
603-615	Leg and knee pains
616-626	Digit disorders
627-696	mtw treatments
697-704	Tongue inflammation
705-738	Cosmetics, body odours and wrinkles
739-749	Dental disorders
750-756	Miscellaneous cases
757-760	Bandage applications
761-763	Coryza (upper respiratory infection)
764-770	Ear disorders
771-782	Miscellaneous cases including alopaecia and screaming children
783-807	Gynaecology and obstetrics
808-830	Gynaecology and breast disorders
831-839	Gynaecology
840-853	Pesticides
854-856	Books on cardiovascular system
857-877	Swellings

Table 5: The evidence for occupations in ancient Egypt and their associated health implications

(Main sources: Lucas 1962; Hunter 1978; Arnold 1991; Shaw and Nicholson 1995; Nicholson and Shaw 2000; Waldron pers comm)

Occupation	Archaeological Record	Human Remains Evidence	Textual Evidence	Artistic Representation	Physical Environment	Potential Health Implications
Quarrying	Quarry sites with tool marks, including: Giza plateau (Lehner 1997a: 206-207) and Gebel Gulab, Aswan (Aston *et al* 2000: 17). Settlements at quarry sites, eg. Gebel el-Asr (Engelbach 1933). Tools including: dolerite pounders (Aston *et al* 2000: 5-17) and copper chisels (Emery 1949: 42-47). (Lucas 1962: 63-66; Arnold 1991: 32-39).	-	Graffiti at quarry sites (Blackden and Willoughby 1892; Couyet and Montet 1912-13; Fakhry 1952; Goyon 1957; Goedicke 1959; Shaw 1987; Eyre 1987a). Quarry mark inscriptions referring to the organisation and transportation of stone (Arnold 1991: 57-63). Physicians affiliated to team (Ghalioungui 1983; Shaw 1998: 250).	-	Exposed desert conditions in temporary shelters, often remote and relying upon supply routes for water and food. The famine depictions at the Unas causeway may represent hardship associated with quarrying expeditions (Vandier 1936; Aston *et al* 2000: 18). Pounders used to cut rock channels. Hazards associated with manoeuvring blocks. Rock falls. Snakes and scorpions.	Injuries and cuts to hands and feet. Fractures and Complications. Eye injuries. Nystagmus from poor lighting. Silicosis from dust inhalation. Crushing injuries. Infectious diseases from overcrowding. Supplies-nutrition. Snake and scorpion bites. Squatting facets from cramped positioning.
Transport ation of stone -by river	Harbour wall at Giza, denoting disembarkation area for stone during inundation (Lehner 1997a: 232). (Aston *et al* 2000: 17-18).	Tomb for harbourmaster at Giza, no human remains evidence to date (Hawass pers com).	Autobiography of Weni (Sethe 1903). Ostraca (Kitchen 1991). Papyrus Amiens (Gardiner 1941). 'Shipwrecked Sailor' (Baines 1990a).	Depictions of transportation include: Unas Causeway (Hassan 1955), Deir el Bahri (Naville 1894-1908), 5th Dynasty tomb of Senedjemib Inty at Giza and 6th Dynasty tomb of Ipy at Saqqara (Porter and Moss 1974-81: 85-87; 671-2).	Hazards associated with loading and unloading and manoeuvring blocks. Crocodiles. Water-borne diseases.	Crushing injuries. Fractures and Complications. Drowning Schistosomiasis.

Occupation	Archaeological Record	Human Remains Evidence	Textual Evidence	Artistic Representation	Physical Environment	Potential Health Implications
Transport ation of stone - by land	Quarry roads eg. Gebel el-Asr to Tushka (Engelbach 1938: 388-9; Harrell and Brown 1994). (Arnold 1991: 79-101; Lehner 1997a: 202-3; Aston *et al* 2000: 18-20). Ramps eg. Gebel el-Asr, Gebel el-Silsila (Aston *et al* 2000: 19-20). Draft cattle remains at 11th Dynasty Mentuhotep complex, Deir el-Bahri (Lehner 1997a: 203).	-	Expedition texts (Christophe 1949). Titles (Baer 1960; Strudwick 1985). Lahun papyri refer to stone haulers (Quirke 1990: 171).	Statue transportation: Djehutihotep tomb relief at Deir el-Bersha (Newberry 1894b: pl. 15).	Levers, ramps and sledges used in transportation. Teams of men and cattle used to drag stone (Lehner 1997a: 202-3). Maximum 20 men required to pull 2 ton block on sledge without gradient (Lehner 1997a: 209).	Labouring in hot climate- dehydration. Crushing injuries. Strains. Rope burns.
Construction in stone	Stone monuments (Arnold 1991: Isler 1992). Evidence for technology (Arnold 1991: 66-116) eg. toolmarks on casing stones at Giza (Lehner 1997a: 221). Pyramid towns including Giza and Lahun (Petrie 1890; 1891; Lehner 1997a; 230). Experimental archaeology (Lehner 1997a: 208-211). (Lucas 1962: 50-63; Arnold 1991: 66-116).	Administrators burials at Giza (Hussein *et al* 2000; Sarry el-Din pers comm). 20th Dynasty Nakht from Thebes, evidence of red granite particles in lungs, thought to be due to inhalation of dust during stone dressing (David and Archbold 2000: 108).	Satire of the trades: 'I'll describe to you also the mason: his loins give him pain; though he is out in the wind, he works without a cloak; his loincloth is a twisted rope and a string in the rear. His arms are spent with exertion, ...' (Lichtheim 1973: 187).	Straight ramp for construction in tomb of Rekhmire (Davies 1943: pl. 60).	Handling and transporting heavy weights. Working at heights. Danger from falling blocks and debris. Experimental archaeology observed high levels of dust inhalation (Stocks pers com).	Labouring in hot climate- dehydration. Multiple trauma from falling from heights. Crushing injuries. Injuries and cuts to hands and feet. Silicosis from dust inhalation. Eye injuries.

Occupation	Archaeological Record	Human Remains Evidence	Textual Evidence	Artistic Representation	Physical Environment	Potential Health Implications
Rock tomb cutting	Rock cut tombs include Valley of the Kings at Thebes (Mackay 1921; Reeves and Wilkinson 1996). Worker's settlement at Deir el-Medina (Bruyère 1924-1953; Bierbrier 1982; Lesko L. 1994b).	Worker's tombs at Deir el-Medina (David 1986; Meskell 1999).	Ostraca list reasons for absence from work including eye defects, burned feet and scorpion stings (Janssen 1980: 136). Stelae from Deir el-Medina refer to possible nystagmus (Demarée and Janssen 1982).	-	Cramped, poorly lit, badly ventilated working conditions. Structural collapse.	Major trauma from roof collapse. Inflammation of bursae on knees and elbows due to repeated minor trauma. Nystagmus. Silicosis.
Construction in mud brick	Mud brick architecture (Kemp 2000: 78-103). Brick moulds (Petrie 1890: 26; David 1986: pl. 18). Brick making location at Mirgissa (Vercoutter 1970: 214-16). (Lucas 1962: 48-50).	-	Papyrus Reisner I refers to brick manufacture (Simpson 1963). Lahun papyrus refers to brick quantities (Quirke 1990).	Brick making and carrying includes: tomb of Rekhmire, Thebes (Davies 1943: pl. 58; 59). Middle Kingdom tomb models (Garstang 1907: 131; Breasted 1948: 52).	Squatting to fill moulds. Hod carrying. Water collected from a well. Mud mixed with cut straw.	Squatting facets. Ankylostomiasis from handling wet mud. Schistosomiasis. Guinea worm.
Sculpting	Statuary. Alabaster work areas at Menkare complex (Saleh 1974). Workshops at Amarna (Krauss 1983). (Lucas 1962: 66-67).	-		Sculptors at work include: tomb of Rekhmire (Davies 1943: pl. 60) and tomb of Amenhotpe-si-se at Abd el-Kurnah (Davies 1923: pl. 8).	Work sites located at quarry or close to final position. Workshops attached to open-air production sites. Working at heights with large statues.	Silicosis. Injuries to hands. Eye injuries.

Occupation	Archaeological Record	Human Remains Evidence	Textual Evidence	Artistic Representation	Physical Environment	Potential Health Implications
Stone vessel Manufacture	Stone vessels (Aston 1994). Unfinished vessels at quarry site of Gebel el-Asr (Shaw pers comm). (Stocks 1986b; 1993).	-	Hieroglyph sign U24 and 25 represent stone workers drill (Gardiner 1994: 518-519).	Depictions of stone vessel manufacture include: tomb of 6th Dynasty Mereruka at Saqqara (Duell 1938: pl. 30), 12th Dynasty Pepyankh at Meir (Blackman and Apted 1953: pl. 17), 18th Dynasty Rekhmire at Thebes (Davies 1943: pl. 54) and 26th Dynasty Aba at Thebes (Davies 1902: pl. 24) (Stocks 1986b: 15)	Repetitive action with bow and 'twist return twist' drill (Stocks 1993). Experimental archaeology observed high levels of stone and copper dust inhalation (Stocks 1993: 601)	Silicosis. Repetitive strain to shoulders and arms.
Potters	Pottery vessels (Hope 1987; Arnold and Bourriau 1993). Pottery workshops, eg. at Deir el-Medina (Bruyère 1939: 264) and Hierakonpolis (Hoffman 1982: 142). Kilns (Hope 1993; Nicholson 1993). Evidence for levigation at Giza (Lehner pers comm). (Bourriau *et al* 2000: 121-147). (Lucas 1962: 367-385).	-	Satire of the trades: 'The potter is under the soil, though as yet among the living; he grubs in the mud more than a pig, in order to fire his pots. His clothes are stiff with clay, his girdle is in shreds; if air enters his nose it comes straight from the fire. He makes a pounding with his feet, and is himself crushed.' (Lichtheim 1973: 186-187).	Potters at work include: 5th Dynasty tomb of Ti at Saqqara (Wild 1953), tomb of Kenamun at Thebes (Davies 1930: pl. 29) and 18th Dynasty tomb of Amenhotpe-si-se at Abd el-Kurnah (Davies and Davies 1923: pl. 8). Trampling for levigation depicted in tomb of Baqt III (Chappaz 1983). Pottery workshop models (Arnold 1993).	Small industries with two or three people, situated outside, adjacent to other industries, including bread and beer making, carpentry and metal working (Bourriau *et al* 2000: 136-7) Firing with use of bonfire or updraft kiln with temperatures in excess of 1000°c. Limited artistic evidence for abdominal protrusion and genital hypertrophy associated with potters (Davies and Davies 1923: pl. 8; Ghalioungui 1962: pl. 3b).	Ankylostomiasis from handling wet mud. Repetitive strain to leg from wheel action. Kiln explosions. Burns.

Occupation	Archaeological Record	Human Remains Evidence	Textual Evidence	Artistic Representation	Physical Environment	Potential Health Implications
Mining	Mining sites include gold, copper, tin and amethyst (Pons Mellado 1995; Shaw 1998; Van der Veen 1998). Gold washing tables (Vercoutter 1959). Grinding stones (Ogden 2000: 161-2).	-	Textual evidence for mining areas (Birch 1852; De Bruyn 1955; Vercoutter 1959). 12th Dynasty stela of Simunt (BM EA 828) recounting mining expedition (Birch 1852; Ogden 2000: 162). Historical evidence for mining in Ptolemaic Egypt, from accounts written by Diodorus Siculus (Booth 1814: 159). (Meyer 1998: 267-271).	Depictions of washing and sorting gold ore include: tomb of Baqt III at Beni Hassan (Chappaz 1983). Depiction of gold washing include: tomb of Khay at Saqqara (Martin 1991: 90). Depictions of the weighing of gold include: Deir el-Bahri (Naville 1894: pl. 10) and the tomb of Puyemré at Thebes (Davies 1922: pl. 36).	Remote desert locations, relying on supplies of water and food. Labouring in hot climates. Risk of attack when located in remote territories. Intensive labour in restricted spaces. Open cast and seam mining. Lack of ventilation.	Trauma from mine collapse. Infectious diseases. Dehydration. Lung disease.
Metal workers	Copper smelting workshops, eg. at Qantir (Pusch 1990), Giza (Lehner 1998: 11). (Scheel 1989; Ogden 2000: 148-176). (Lucas 1962: 195-257). Gold working (Ogden 2000: 162-6).	-	Satire of the trades: 'But I have seen the smith at work at the opening of his furnace; With fingers like claws of a crocodile he stinks more than fish roe.' (Lichtheim 1973: 186) Amarna letters referring to weight and distribution (Moran 1992; Ogden 2000: 163).	Depictions of copper smelting, include: tomb of Wepemnofret, at Giza (Weinstein 1974: 23-5), tomb of Rekhmire, Thebes (Davies 1943: pl. 52) and tomb of Puyemré at Thebes (Davies 1922: pl. 23). Depictions of melting gold include: tomb of Nebamun (Davies 1925: pl. 11).	Smelting temperatures of 700-1083°c (Lucas 1962: 211). Handling hot crucibles, casting occasionally depicted with sticks or stones used as hand protection. Arsenic used for alloys (Lucas 1962: 214). Exposure to copper ores.	Burns. Kiln explosions. Arsenic poisoning. Burns.

Occupation	Archaeological Record	Human Remains Evidence	Textual Evidence	Artistic Representation	Physical Environment	Potential Health Implications
Faience production	Faience production sites including Lisht, Kerma, Malkata, Memphis and Amarna (Nicholson and Peltenburg 2000: 181-186). Also at Giza (Lehner pers comm). Artifactual evidence including tiles from Djoser pyramid complex. Experimental archaeology (Stocks 1997). (Nicholson and Peltenburg 2000: 177-194).	-	Funerary texts referring to title of overseer of faience workers (Nicholson and Peltenburg 2000: 178-9).	Possible depiction of faience production in 26th Dynasty tomb of Aba (Davies 1902: pl. 25).	Archaeological evidence suggests outdoor activity in workshop courtyard with kiln (Nicholson and Peltenburg 2000: 183). Thought to have been produced in association with, and possibly at the same location as stone vessel manufacture as the waste product is incorporated. (Stocks 1997).	Burns. Silicosis from proximity to stone vessel drilling.
Glass production	Artifacts from Middle Kingdom onwards. Kilns at Amarna (Nicholson and Henderson 2000: 201). Possibly imported raw material and re-melted in Egypt, as opposed to all stages of production (Nicholson and Henderson 2000: 195-224). (Lucas 1962: 179-194).	-	Glass production referred to in the Amarna letters (Moran 1992; Shaw and Nicholson 1995: 112).	-	Archaeological evidence suggests the use of an open hearth with bellows and remoulding of glass when molten (Nicholson and Henderson 2000: 202). Lead used in yellow glass (Lucas 1962: 190).	Burns. Lead poisoning.

Occupation	Archaeological Record	Human Remains Evidence	Textual Evidence	Artistic Representation	Physical Environment	Potential Health Implications
Papyrus	Papyrus rolls and documents (Leach and Tait 2000: 227-253).	-	Satire of the trades: 'The reed-cutter travels to the Delta to get arrows; when he has done more than his arms can do, mosquitoes have slain him, gnats have slaughtered him, he is quite worn out.' (Lichtheim 1973: 186).	Depictions of papyrus gathering include: 5th Dynasty mastaba of Ti (Wild 1953: pl. 76, 110), 5th Dynasty tombs of Akhethetep and Ptahhetep at Saqqara (Davies 1900-1: pl. 14; 21), tomb of Puyemré at Thebes (Davies 1922: pl. 15; 19).	Papyrus gatherers were frequently depicted with abdominal protrusion and/or genital hypertrophy (Davies 1900-1: pl 14; 21; Wild 1953: 110), possibly indicating abdominal involvement of schistosomiasis, contracted as a result of wading in infested waters.	Schistosomiasis
Basket making	Baskets and matting from tomb and settlement contexts (Wendrich 2000: 254-67). (Lucas 1962: 128-133).	-		Depictions of mat-making include: tomb of Khety at Beni Hassan (Crowfoot 1933; Wendrich 2000: 261).	Squatting position adopted for mat making. Coiled basket production requires few specialised tools and so can be performed in a variety of settings, other methods of manufacture were semi-professional (Wendich 2000: 265-6).	Squatting facets

Occupation	Archaeological Record	Human Remains Evidence	Textual Evidence	Artistic Representation	Physical Environment	Potential Health Implications
Textile weaving	Textile evidence from tomb and settlement contexts (Vogelsang-Eastwood 2000: 268-298).	20th Dynasty weaver, Nakht form Thebes, had developed squatting facets from task-related position (David and Archbold 2000: 121). Although he died from pneumonia at approx 15 years he also showed evidence of malnourishment, parasitic infestation, including schistosomiasis and trichinosis, black and desert lung disease and malaria (David and Archbold 2000: 107).	Satire of the trades: 'the weaver in the workshop, he is worse off than a woman; with knees against his chest, he cannot breathe air.' (Lichtheim 1973: 188)	Depictions of spinning techniques and loom design include: 11th and 12th Dynasty tombs at Beni Hassan (Newberry 1894b: pl. 26), 11th Dynasty tomb of Dagi at Thebes (Davies 1913: pl. 37), 18th Dynasty tomb of Thutnefer at Thebes (Davies 1927: 233-55) and the 19th Dynasty tomb of Neferronpet at Thebes (Davies 1948: pl. 35). Tomb models of weaving workshops (Winlock 1955: 29-33; Vogelsang-Eastwood 2000: 268).	Squatting at horizontal loom, in covered workshops. Poor ventilation. Eye disorders from strain.	Squatting facets. Spread of infectious diseases. Repetitive strain injury from shuttle or constant repetition of movements.

Occupation	Archaeological Record	Human Remains Evidence	Textual Evidence	Artistic Representation	Physical Environment	Potential Health Implications
Leatherwork	Artefacts mainly from tomb contexts (Van Driel-Murray 2000: 299-319). Remains of slaughter houses (Verner 1986; Gilbert 1988), including Amarna (Borchardt and Ricke 1980). (Lucas 1962: 33-37).	-	Satire of the trades: 'The cobbler suffers much among his vats of oil; he is well if one's well with corpses, what he bites is leather.' (Lichtheim 1973: 188-189)	Depictions of animal slaughter and skinning include: the tomb of Pepyankh at Meir (Blackman 1914: pl. 10-11) and 5th Dynasty tombs of Anta and Shedu at Deshasha (Petrie 1898: pls. 13; 21). Depictions of sandal-makers workshops include: the tomb of Rekhmire at Thebes (Davies 1943: pls. 53; 54).	Skinning with sharp knives. Little evidence for conventional tanning until Greco-Roman period, lightly cured in Pharaonic period (Van Driel-Murray 2000: 299). Skins depilated with urine and ash or flour and salt pastes (Lucas 1962: 35; Van Driel-Murray 2000: 302).	Anthrax from handling hides. Cuts.
Carpenters	Wood working tools (Emery 1949: 30-7; 42-8) (Gale *et al* 2000: 334-371). Furniture (Killen 1994). Boats (Vinson 1994).	-	Satire of the trades: 'The carpenter who wields an adze, he is wearier than a field-labourer; His field is the timber, his hoe the adze. There is no end to his labour…' (Lichtheim 1973: 186)	Depictions of timber processing include: 6th Dynasty tomb of Iteti at Deshasha (Petrie 1898: pl. 21), 5th Dynasty tomb of Ti at Saqqara (Wild 1966: pl. 74) and tomb of Rekhmire at Thebes (Davies 1943: pl: 55). Carpenters at work include: tomb of Ipuy at Deir el-Medina (Davies 1927: pl. 37). Depictions of boat building include: 5th Dynasty tomb of Ti at Saqqara (Wild 1953: pl. 129).	Tree felling. Cleaving. Wood storage for seasoning. Tools include: saws, adzes and chisels. (Gale *et al* 2000: 353-356).	Injuries. Splinters.

Occupation	Archaeological Record	Human Remains Evidence	Textual Evidence	Artistic Representation	Physical Environment	Potential Health Implications
Mummification	Mummified remains both human and animal (Andrews 1984; David 2000: 372-389). (Lucas 1962: 270-360).	-	-	-	Working in embalming tent in desert location. Evisceration. Handling of natron. Packing and bandaging body 40 days after death.	Infection from handling infected bodies, eg., tuberculosis, septicaemia.
Cereal Production	Tools. Granaries (Petrie 1891; Badawy 1966; Kemp 1986). Archaeobotanical remains (Murray 2000: 509-10) (Murray 2000: 505-536).	-	Texts referring to crop yield and rations (Nims 1958; Helch 1987; Valbelle 1985; Kemp 1986; Eyre 1995). Especially the Wilbour papyrus (Gardiner 1948a; 1948b; O'Connor 1972; Adams 1997), Hekanakhte letters (James 1962; Baer 1963) and texts from Deir el-Medina (Janssen 1975; Valbelle 1985). Satire of the trades: 'The farmer wails more than the guinea fowl, his voice is louder than a ravens; his fingers are swollen and stink to excess.' (Lichtheim 1973: 187).	Agricultural processes include: 5th Dynasty tomb of Mereruka at Saqqara (Duell 1938: pl. 169), tomb of Ipuy at Deir el Medina (Davies 1927: 30), tomb of Nakht (Davies 1917: pl: 19) and tomb of Rekhmire (Davies 1943: pl. 39). Tomb models (Breasted 1948; Winlock 1955; Vandier 1978).	Labouring in heat. Contact with irrigation canals. Hand or ox ploughing. Mud handling. Cattle for threshing. Dust inhalation from winnowing. Sicles and sharp tools. Grain moulds.	Dehydration. Schistosomiasis. Asthma. Farmers lung from mould inhalation. Ankylostomiasis.

Occupation	Archaeological Record	Human Remains Evidence	Textual Evidence	Artistic Representation	Physical Environment	Potential Health Implications
Brewing and Baking	Evidence for baking installations include: Giza (Lehner 1999b: 8-11), Amarna (Kemp 1987) and Deir el-Medina (Bruyère 1939). Mortars eg. at Amarna (Samuel 2000: 560-1). Quern stones (Samuel 2000: 561). Ovens, bread moulds and bread platters eg at Giza (Lehner 1997a: 236-7; 1999b; 10-13; Samuel 2000: 566-8). Archaeobotanical remains (Samuel 2000: 544). Bread and beer from elite tombs (Samuel 2000: 542-3). Experimental archaeology (Roberts 1995; Samuel 2000: 561-70). (Samuel 2000: 537-576). (Lucas 1962: 10-16).	-	Texts referring to production quantities (Spalinger 1986), including Rhind mathematical papyrus (Peet 1923: 112-122; Robins and Shute 1987). Satire of the trades: 'The stoker, his fingers are foul, their smell is that of corpses; his eyes are inflamed by much smoke, he cannot get rid of his dirt.' (Lichtheim 1973: 188)	Baking and brewing processes: tomb of Ti at Saqqara (Wild 1966), tombs of Amenemhat, Khnumhoyep, and Khety at Beni Hassan (Newberry 1893: 30-1; 68; 1894a; 48; 55-6), and tomb of Kenamun at Thebes (Davies 1930: pl. 58). 5th Dynasty tomb of Niankhkhnum and Khnumhotep shows a woman stoking the fire and a man removing the hot moulds from the kiln with the use of a stick to protect his hands (Moussa and Altenmüller 1971: pl. 23; 26). Tomb models (Breasted 1948; Winlock 1955; Vandier 1978).	Archaeological and artistic evidence suggests cramped conditions in small bake houses where furnace was located adjacent to processing areas. Slow heating required for brewing. Quern stones used for milling prior to baking and brewing.	Explosions from dust. Asthma. Dermatitis from flour. Burns. Dehydration from working adjacent to kiln.

Occupation	Archaeological Record	Human Remains Evidence	Textual Evidence	Artistic Representation	Physical Environment	Potential Health Implications
Viticulture and Wine Production	Wine jars, seals and labels (Murray *et al* 2000: 594-9) Wine production centres (Bietak 1996). Archaeobotanical remains (Murray *et al* 2000: 580) (Lerstrup 1992; Murray *et al* 2000: 577-608). (Lucas 1962: 16-27).	-	Origin and distribution information from wine jar sealings and labels (Murray *et al* 2000: 579). Funerary texts include wine in offering lists eg. Pyramid texts (Murray *et al* 2000: 579).	Wine production processes include: 5th Dynasty tomb of Ptahhotep at Saqqara (Davies 1900-1: pl. 21), 5th Dynasty Niankhkhnum and Khnumhotep (Moussa and Altenmüller 1971: pl. 39), 6th Dynasty tomb of Mereruka at Saqqara (Duell 1938), tomb of Puyemré at Thebes (Davies 1922: pl. 12), tomb of Rekhmire (Davies 1943: pl. 45) and 18th Dynasty tomb of Nakht (Davies 1917: pl. 22; 23; 26).	Harvesting grapes in August. Shoulder yokes used to transport grapes to treading location. Treading with bare feet. Pressing grapes by twisting net held at each end with poles. One participant usually depicted performing acrobat feats to keep the poles distanced (Murray *et al* 2000: 585-591).	Dehydration. Musculo-skeletal disorders. Alcoholism.
Cattle Herding	-	-	12th Dynasty 'The story of the Herdsman' (Goedicke 1970).	Cattle herders with *genu recurvatum* and/or emaciation include: 5th Dynasty tombs of Ptahhetep and Idout at Saqqara (Davies 1900-1: pl. 21; Macramallah 1935: pl. 20) and 12th Dynasty tombs of Senbi and Ukh-hotep at Meir (Blackman 1914: pl. 9; 1915: pl. 3).	Proximity to cattle. Contact with marsh waters in Delta.	Bovine tuberculosis. Schistosomiasis. Kicks and trampling. Brucellosis.

Occupation	Archaeological Record	Human Remains Evidence	Textual Evidence	Artistic Representation	Physical Environment	Potential Health Implications
Meat, poultry and fish processing	Food remains in tomb deposits. Processing areas include: Remains of slaughter houses (Verner 1986; Gilbert 1988). Possible fish drying unit at Giza (Lehner 2000a: 6). (Ikram 2000: 656-671)	-	Offering formulae (Parkinson 1991).	Slaughtering and meat processing scenes include: 5th Dynasty tomb of Ti at Saqqara (Wild 1966) and 12th Dynasty tomb of Interfoqer at Thebes (Davies 1920: pl. 9). Poultry processing include: 18th Dynasty tomb of Nakht at Thebes (Davies 1917: pl. 26) and 20th Dynasty tomb of Ipuy at Thebes (Davies 1927: pl. 30). Fish processing scenes include: 5th Dynasty tomb of Ti at Saqqara (Wild 1966), tombs of Puyemré and Rekhmire at Thebes (Davies 1922: pl. 17; 1943: pl. 46).	Fishermen in contact with marsh and river water. Fishermen depicted with abdominal distension and genital hypertrophy in 6th Dynasty tomb of Mehou at Saqqara (Ghalioungui 1983: 8). Manoeuvring large animals prior and during slaughter. Poultry plucked and eviscerated. Fish eviscerated and often dried or salted. Use of sharp knives.	Fishermen – schistosomiasis. Cuts. Salmonella from poultry.
Military	Weapons (Petrie 1917; McLeod 1982; Shaw 1991).	Slain soldiers (Winlock 1945; Filer 1995; 1997).	Battle speeches (Goedicke 1985; Morschauser 1985). (Faulkner 1953).	Battle reliefs depicted enemy injury include: Kadesh at Abu Simbel (Desroches Noblecourt *et al* 1971; Spalinger 1985). Archers depicted with protective wrist bands (Blackman 1914: 7). Tomb models (Winlock 1955).	Battle trauma. Egyptians used bow and arrows, mace, axe and dagger. Horse drawn chariot from New Kingdom. Unprotected heads, shields only, armour introduced in New Kingdom consisting of bronze discs sewn onto linen (Shaw 1991).	Injuries. Death.

Occupation	Archaeological Record	Human Remains Evidence	Textual Evidence	Artistic Representation	Physical Environment	Potential Health Implications
Jewellers	Jewellery frequently from tomb contexts (Andrews 1990). Experimental archaeology in bead drilling (Stocks 1989).	-	Satire of the trades: 'The jewel-maker bores with his chisel in hard stones of all kinds; When he has finished the inlay of the eye, his arms are spent, he's weary; Sitting down when the sun goes down, his knees and back are cramped.' (Lichtheim 1973: 186)	Depictions of jewellers include: tomb of Amenhotpe-si-se (Davies and Davies 1923: pl. 10). Workers were frequently represented as dwarfs eg. the mastaba of Mereruka (Duell 1938: pl. 30). Depictions of bead drilling include: tomb of Rekhmire (Davies 1943: 54).	Squatting or sitting position in workshops. Depicted adjacent to bead borers so associated dust inhalation. Repetitive strain from use of bow drill.	Squatting facets. Silicosis.
Musicians	Musical instruments frequently from tomb contexts (Manniche 1991).	25th Dynasty chantress Asru showed evidence of parasite infestation, including hydatid cyst in lung and a skull defect possibly relating to a metastatic growth (David and Archbold 2000: 134-135).		Depictions of musicians include: tomb of Kenamun (Davies 1930: pl. 9) and tomb of Rekhmire (Davies 1943: pl. 66). Harpists frequently depicted obese and blind (Davies 1917: pl. 15; Manniche 1991: 99).		Repetitive strain injuries.

Occupation	Archaeological Record	Human Remains Evidence	Textual Evidence	Artistic Representation	Physical Environment	Potential Health Implications
Gardeners	Tools (Petrie 1917)	6th Dynasty gardener with fatal head wounds (Filer 1997: 61).	Satire of the trades: 'The gardener carries a yoke, his shoulders are bent with age; there's a swelling on his neck and it festers. In the morning he waters vegetables, the evening he spends with the herbs, while at noon he has toiled in the orchard. He works himself to death more than all other professions.' (Lichtheim 1973: 187).	Hunchback operating a *shaduf* in the 20th Dynasty tomb of Ipuy at Deir el-Medina (Davies 1927: pl. 28).	Labouring in heat. Contact with irrigation water from canals. *Shaduf* operating.	Dehydration. Schistosomiasis. Tetanus infections from penetrating injuries.

Table 6: The slain soldiers of Neb-hetep-Re : catalogue of injuries (Winlock 1945)

Type of wound	Number of instances	Possible causative factor
Left frontal - circular depression	1	Healed wound - right-handed blow
Left parietal - oval depression	1	Healed wound - right-handed blow
Left frontal - cresent scar and fracture	1	Healed wound - right-handed blow
Right zygomatic arch – fracture, right coronal suture - fracture	1	Healed wound - left-handed blow
Tissue wound (7.5cms) - left side, between 7th and 8th rib	1	Dagger or arrow
Umbilical hernia	1	Unlikely to be a traumatic injury
Tissue wound - heel	1	Possibly post-mortem
Penetrating wound (21-22cms) - right brachio-radial muscle	1	Arrow
Penetrating wound - entering left neck and exiting right side between 3rd and 4th ribs leaving reed shaft insitu in thoracic cavity	1	Arrow
Penetrating wound - entering left side between scapula and vertebrae at level of 6th and 7th ribs and exiting front of chest leaving reed shaft insitu in thoracic cavity	1	Arrow
Penetrating wound - right side of neck	1	Arrow
Penetrating wound - entering left orbital socket and penetrating 5.5cms into sinus cavity	1	Arrow
Penetrating wound - entering inner margin of right scapula	1	Arrow
Penetrating wound - entering left side at 2nd rib and lodging in left lung	1	Arrow
Penetrating wound – entering left side mid-point coronal suture and causing depressed fracture	1	Arrow
Fracture - left side of jaw	2	Stone missile
Gash (6cms) and depressed fracture - right frontal bone and detachment of right temporal, parietal and sphenoid bones	1	Sharp missile
Depressed fracture - right supra-orbital margin and fracture of right nasal bone	1	Stone missile
Depressed fracture - left frontal bone	2	Stone missile
Depressed fracture - left frontal bone and fracture of right maxilla	1	Stone missile
Tissue wound (3cms) - frontal area	1	Stone missile
Depressed fractures - right maxilla, orbital margin and floor and right parietal bone	1	Stone missile
Depressed fracture - left parietal bone	1	Stone missile

Type of wound	Number of instances	Possible causative factor
Depressed fractures - nasal bone, frontal processes and maxillae	1	Stone missile
Depressed fracture – left frontal bone and fractured left maxilla	1	Stone missile
Depressed fracture – right frontal bone	2	Stone missile
Face crushed from left with multiple injuries	6	Direct blows to face causing death, one case of post-mortem damage
Face crushed from right with multiple injuries	1	Direct blows to face causing death
Head crushed from right causing multiple injuries	2	Direct blows to head causing death
Head crushed from left causing multiple injuries	4	Direct blows to head causing death
Head crushed comprehensively	2	Direct blows to head causing death

Appendix 2: Figures

Figure 1: Ipuy tomb furniture construction scene
(after: Davies 1927: pl. 37)

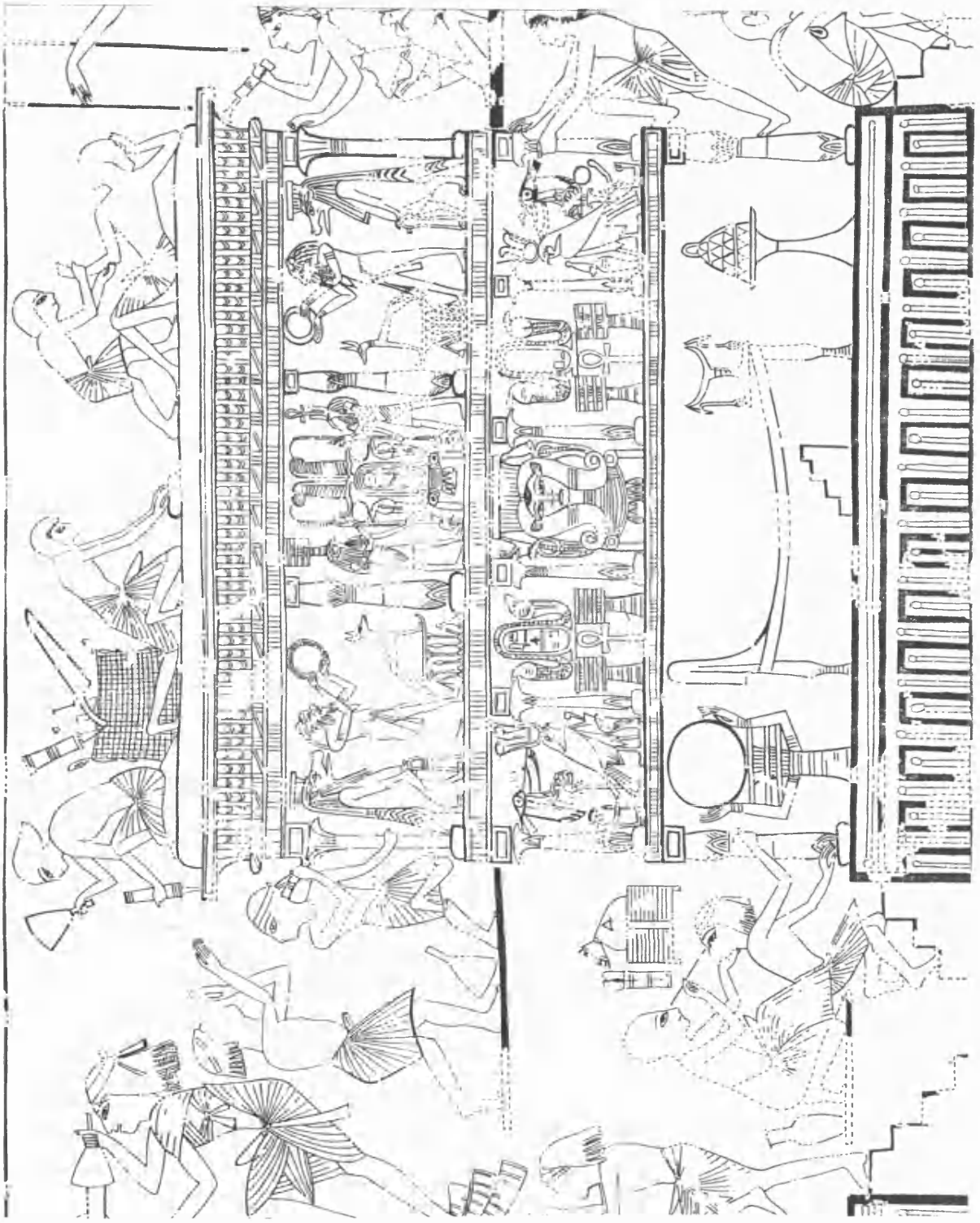


Figure 2: Injured soldier at Abu Simbel
(after: Desroches Noblecourt *et al* 1971: pl. 4)

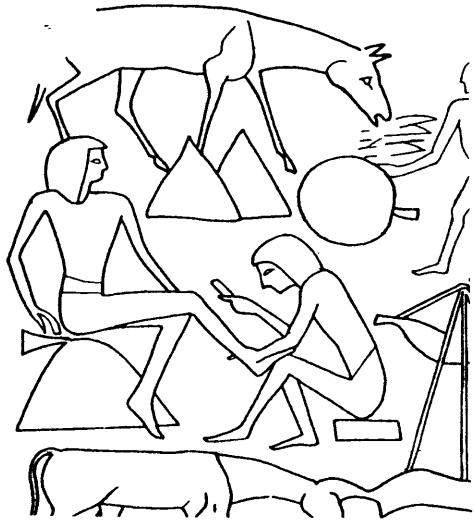


Figure 3: Circumcision scene
(after Kanawati and Hassan. 1997: pl. 55)

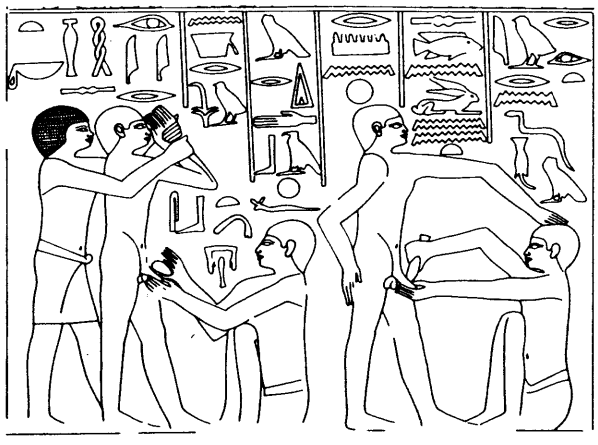


Figure 4: Ipuy gardener scene
(after: Davies 1927: pl. 28)

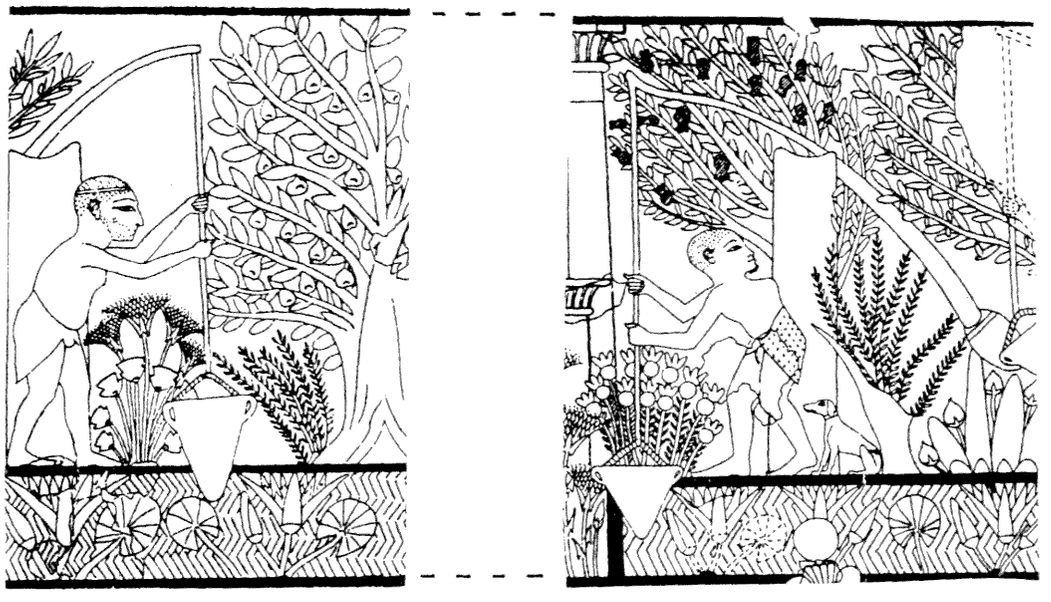


Figure 5: Hunchback
(after: Cave 1939: figure 2; Lepsius 1897-1913: pl. 27)

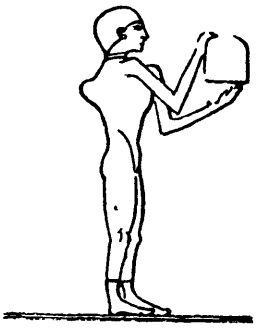


Figure 6: Hunchback
(after: Wild 1953: pl. 126)

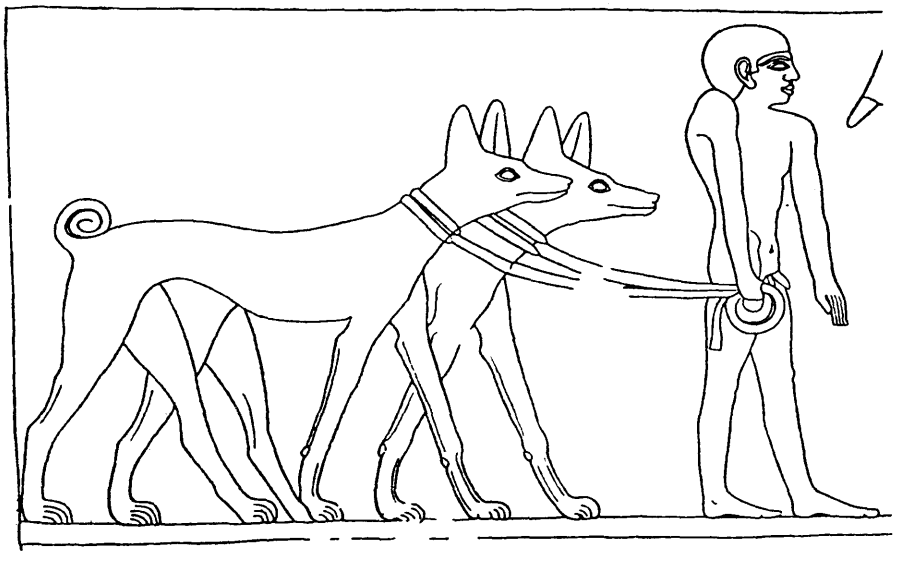


Figure 7: Hunchback
(after: Newberry 1894a: pl. 32)

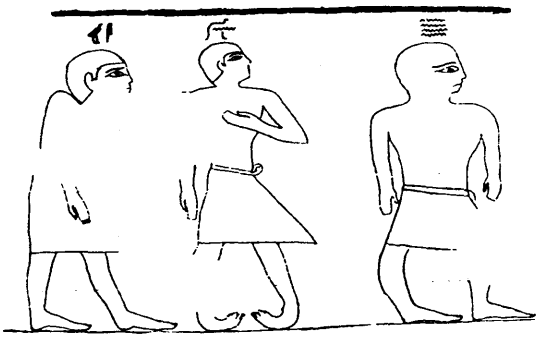


Figure 8: Herdsman with deformed knee
(after: Davies 1900-1901: volume 1: pl. 21)

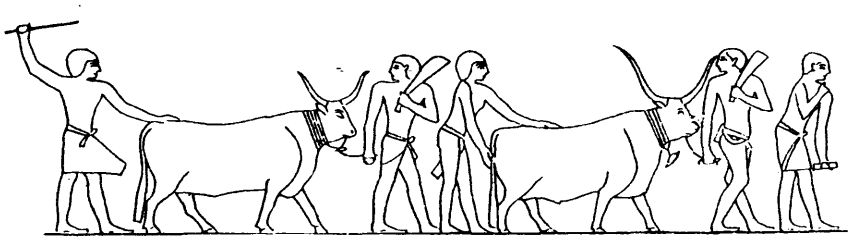


Figure 9: Herdsman with deformed knee
(after: Macramallah 1935: pl. 20)

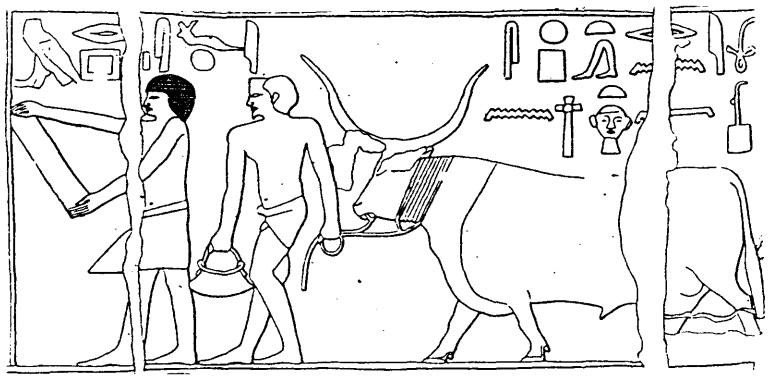


Figure 10: Herdsman with deformed knee and emaciation
(after: Blackman 1914: pl. 9)

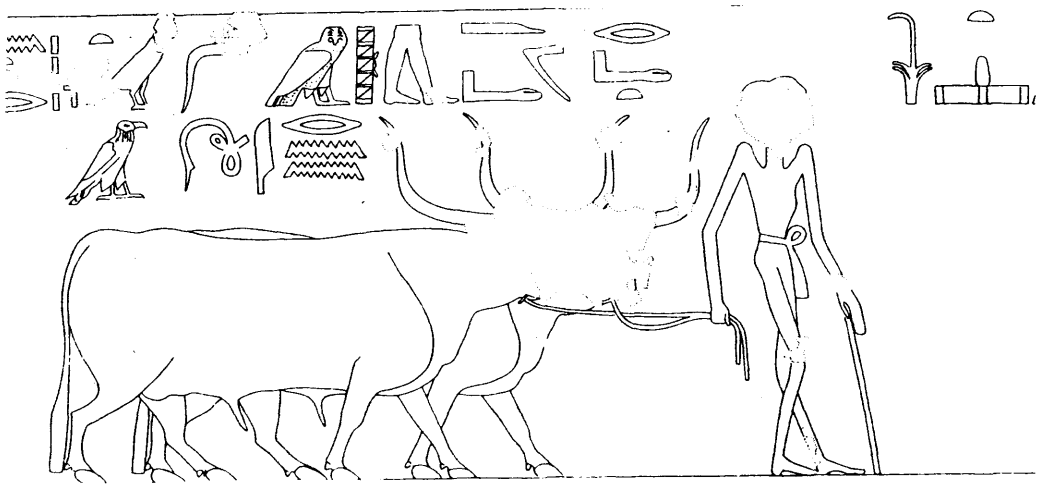


Figure 11: Herdsman with deformed knee and emaciation
(after: Blackman 1915: pl. 3)

Figure 12: Umbilical hernia
(after: Davies 1900-1901: volume 2: pl. 17)

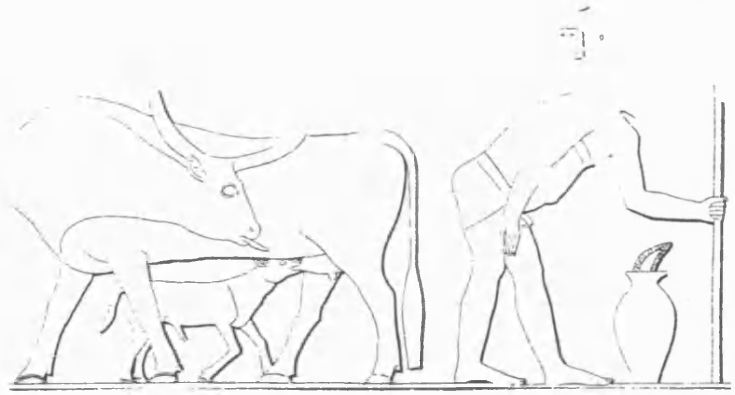


Figure 13: Umbilical hernia
(after: Davies and Davies 1923: pl. 8)

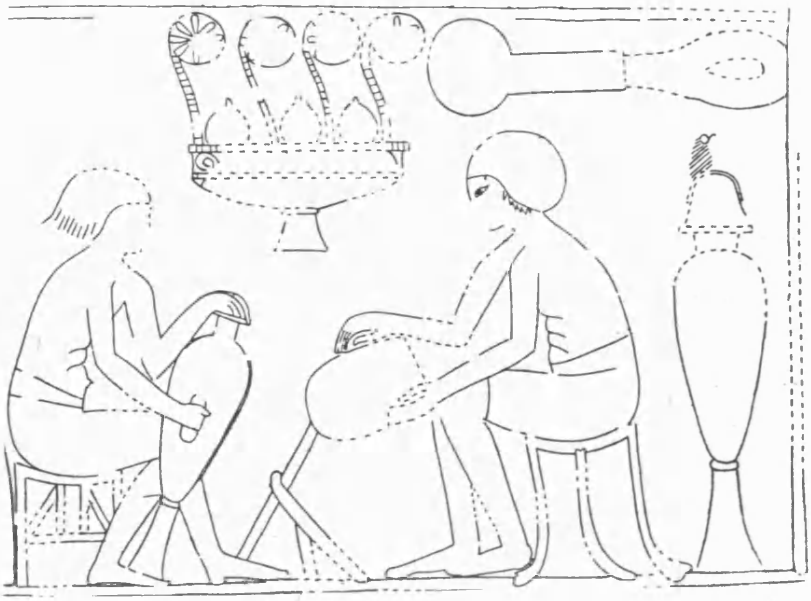


Figure 14: Genital hypertrophy
(after: Davies 1900-1901: volume 2: pl. 14)

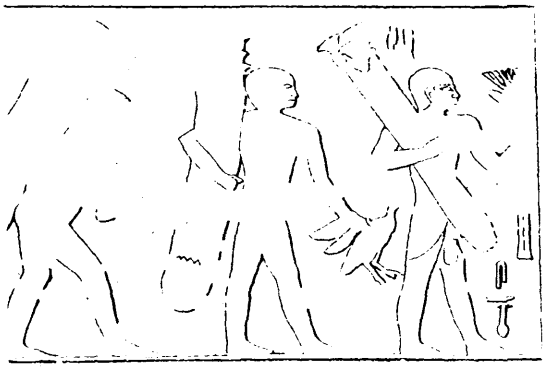


Figure 15: Genital hypertrophy
(after: Wild 1953: pl. 110)

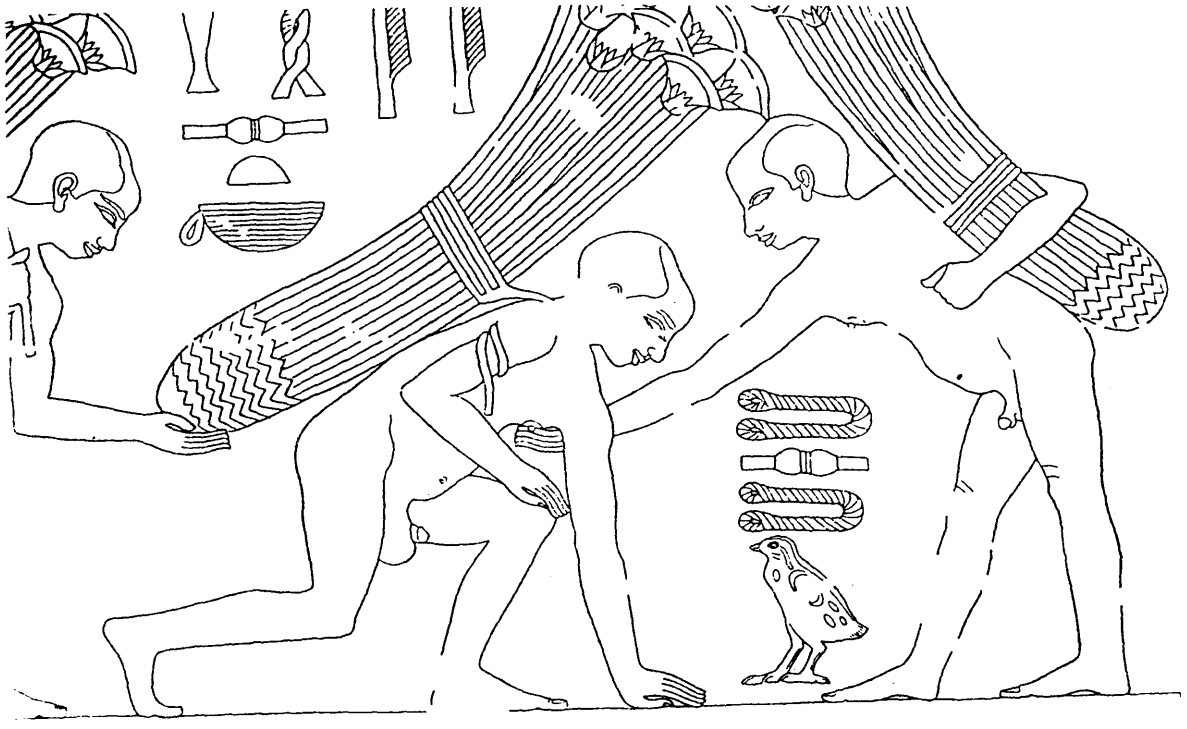


Figure 16: Genital hypertrophy
(after: Wild 1953: pl. 114)

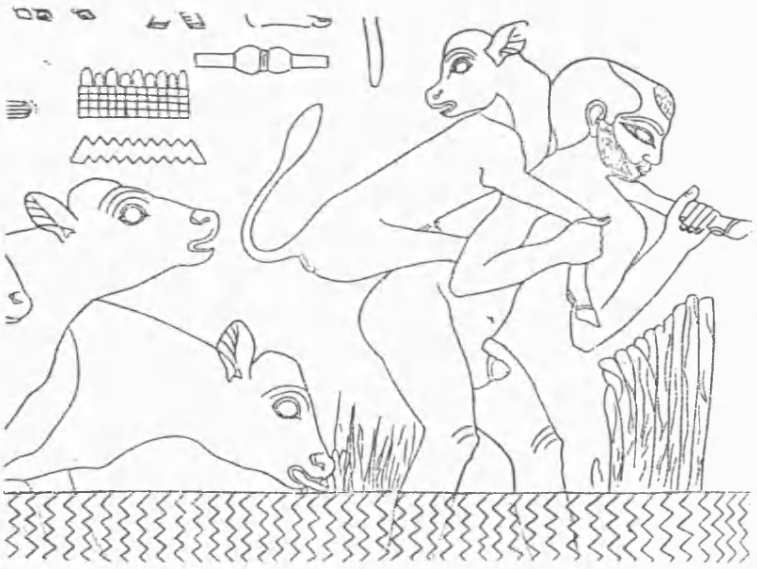


Figure 17: Genital hypertrophy
(redrawn from: Ghalioungui 1962: pl. 3b)

Figure 18: Genital hypertrophy and hernia
(after: Ghalioungui 1973: figure 7)

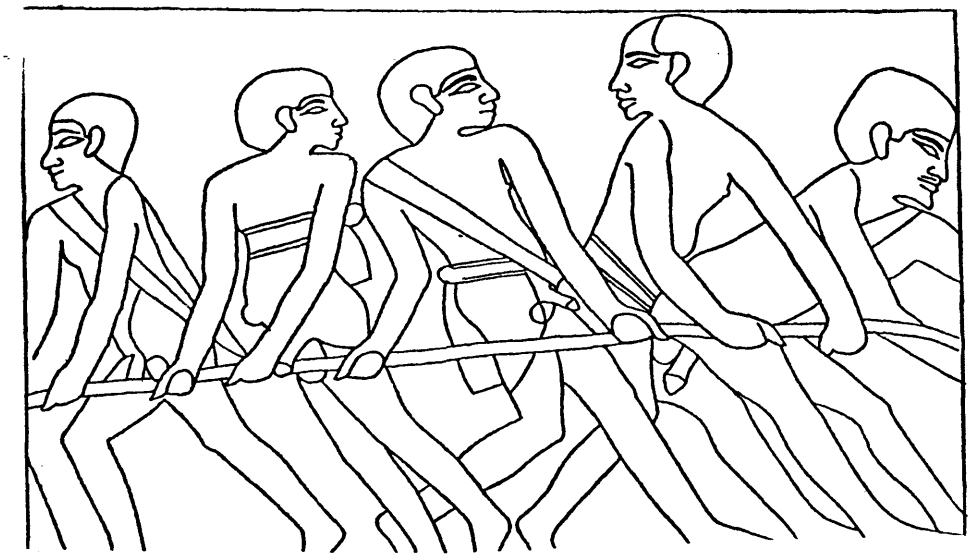


Figure 19: Genital hypertrophy and abdominal distension
(after: Wild 1953: pl. 111)

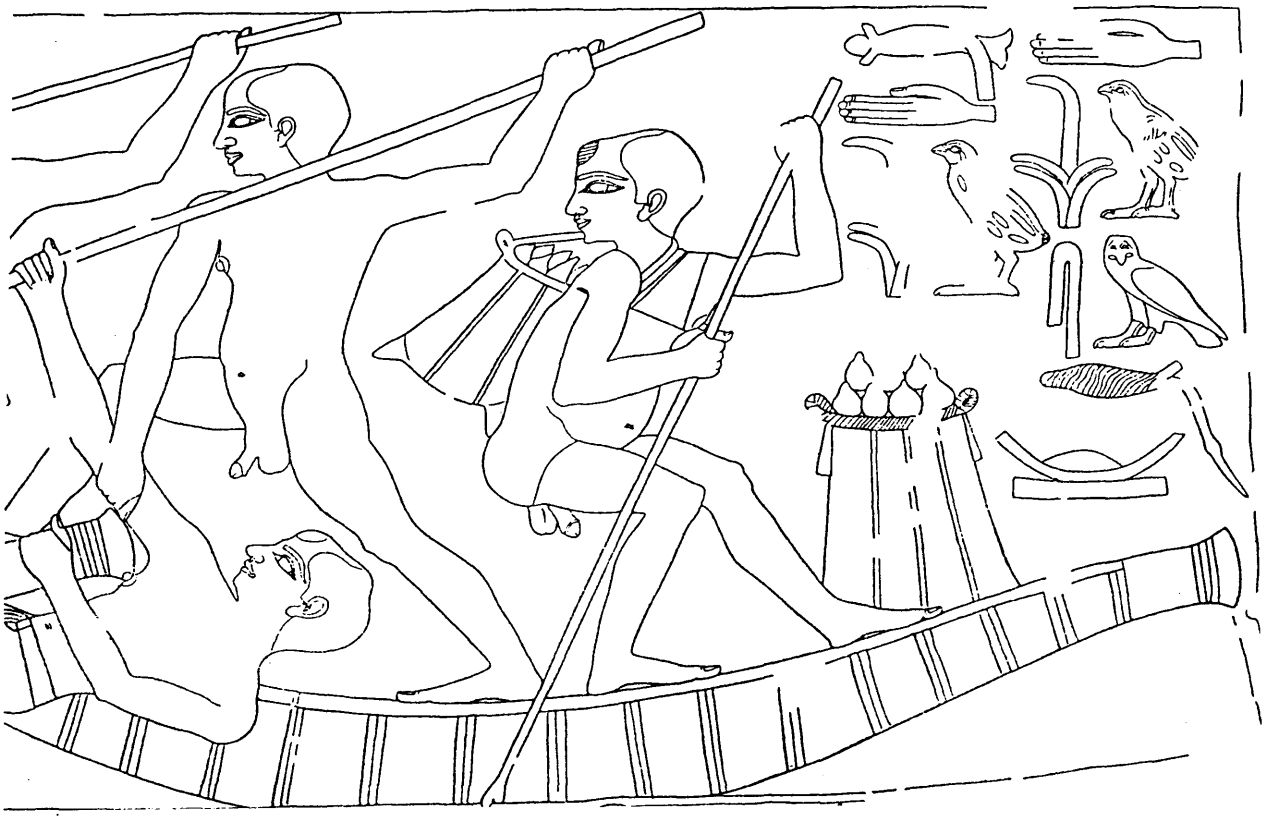


Figure 20: Genital hypertrophy and abdominal distension
(redrawn from: Blackman 1924: pl. 8)

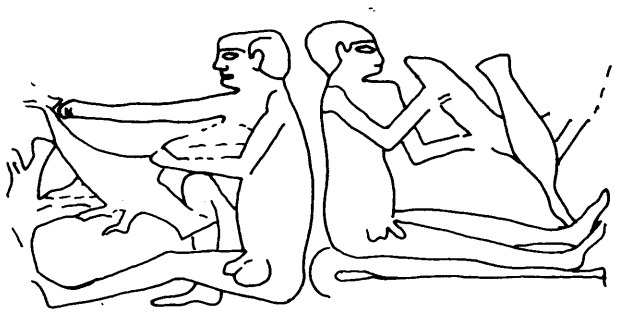


Figure 21: Genital hypertrophy and abdominal distension
(redrawn from: Ghalioungui 1962: pl. 3a)

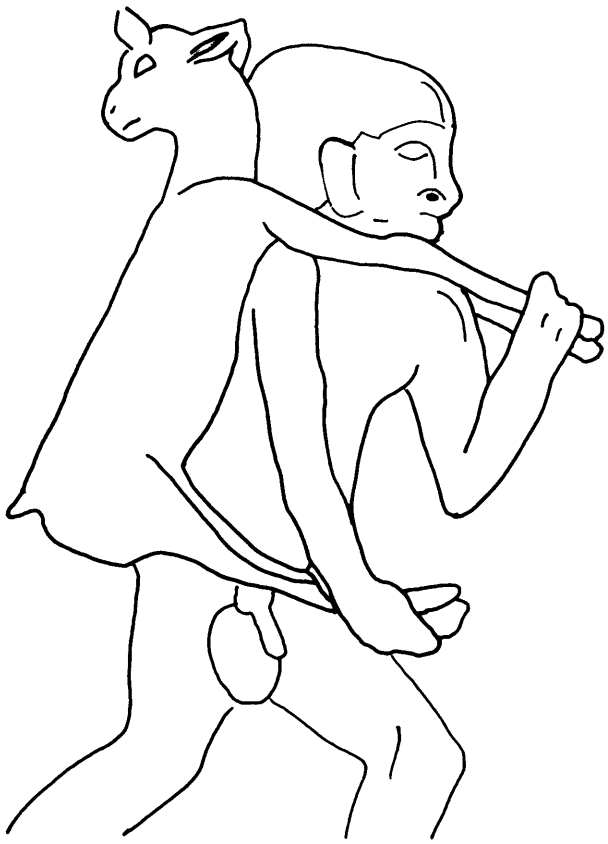


Figure 22: Genital hypertrophy and abdominal distension
(redrawn from: Nunn 1996: 93; Capart 1907: pl. 39)

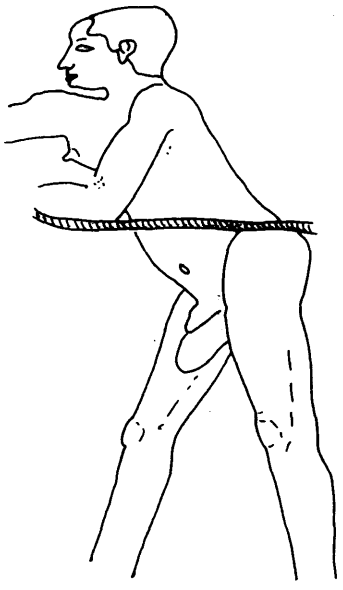


Figure 23: Genital hypertrophy, abdominal distension and hernia
(redrawn from: Ghalioungui 1962: pl. 3d)

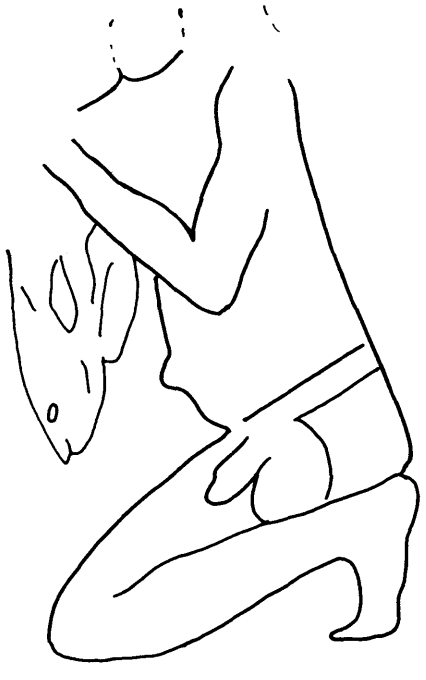


Figure 24: Genital hypertrophy, abdominal distension and hernia
(after: Ghalioungui 1973: figure 8)

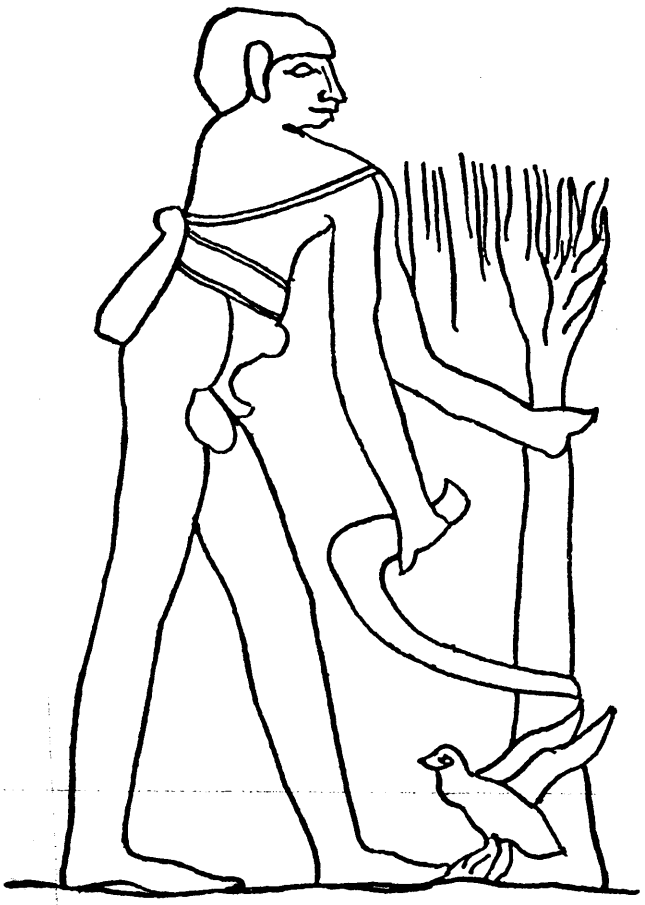


Figure 25: Blind musician
(after: Davies 1917: pl. 15)

Figure 26: Dwarfism
(after: Kanawati and Hassan 1997: pl. 40)

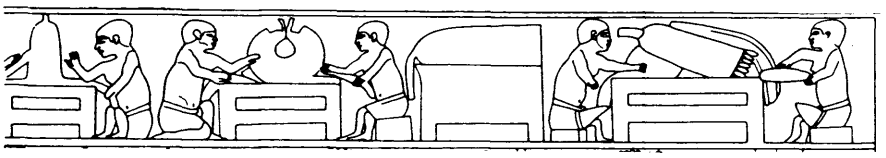


Figure 27: Metal workers and protective equipment
(after: Davies 1943: pl. 52)

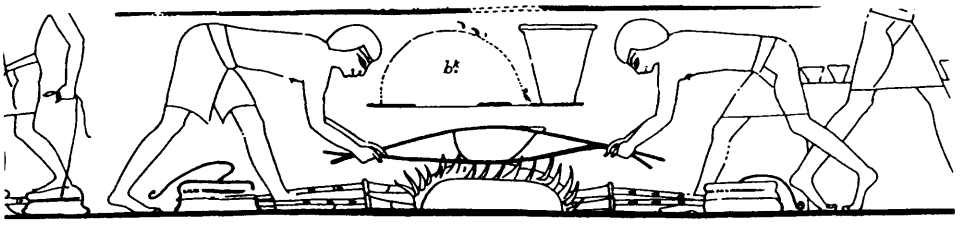


Figure 28: Metal workers and protective equipment
(after: Duell 1938: pl. 30)

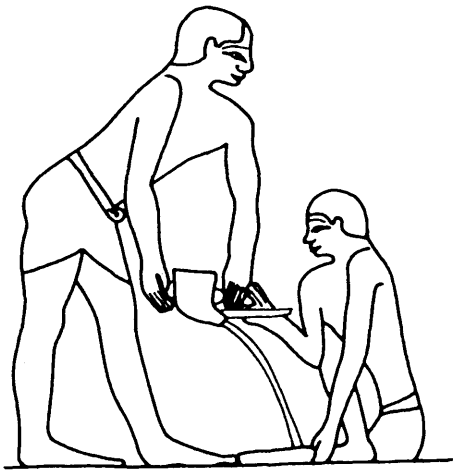


Figure 29: Life preserver and boatman
(after: Wild 1953: pl. 124)

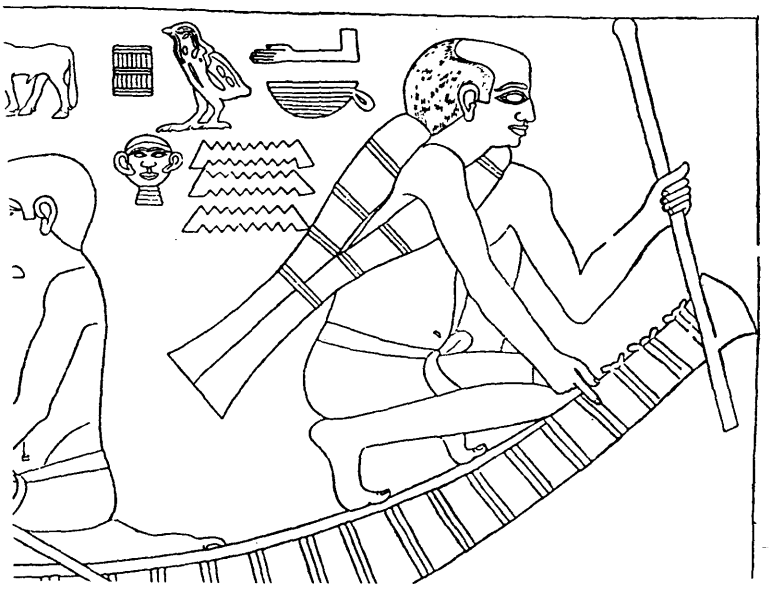


Figure 30: Life preserver and herdsman
(after: Davies 1900-1901: volume 2: pl. 8)

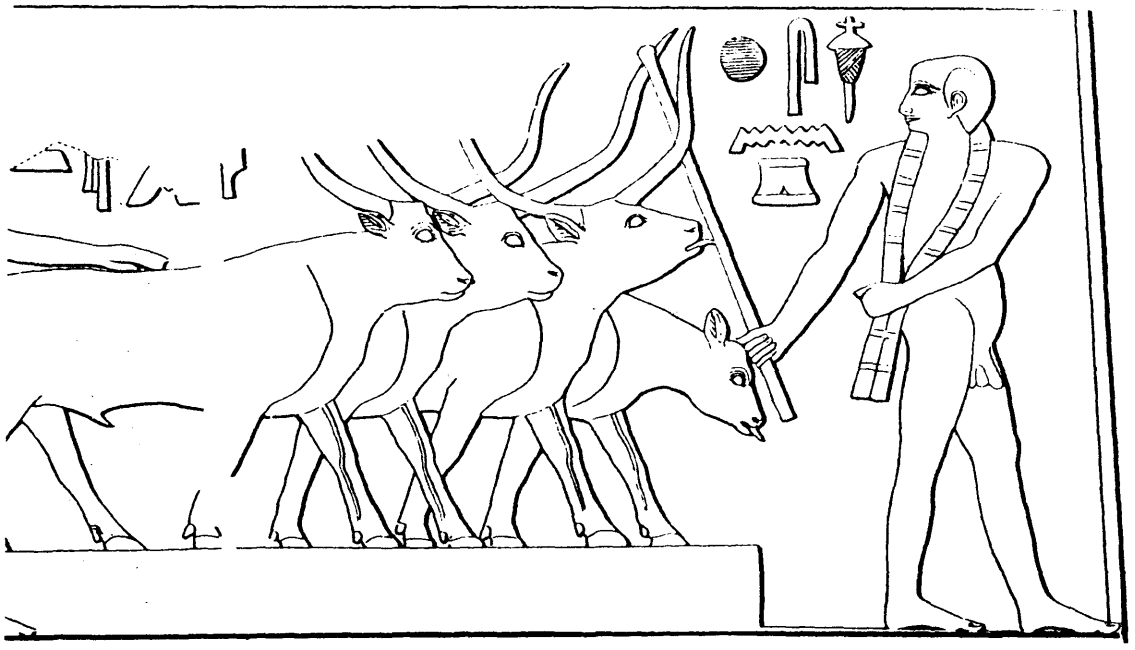


Figure 31: Giza plateau and pyramid complex
(Lehner 1997a: 230)

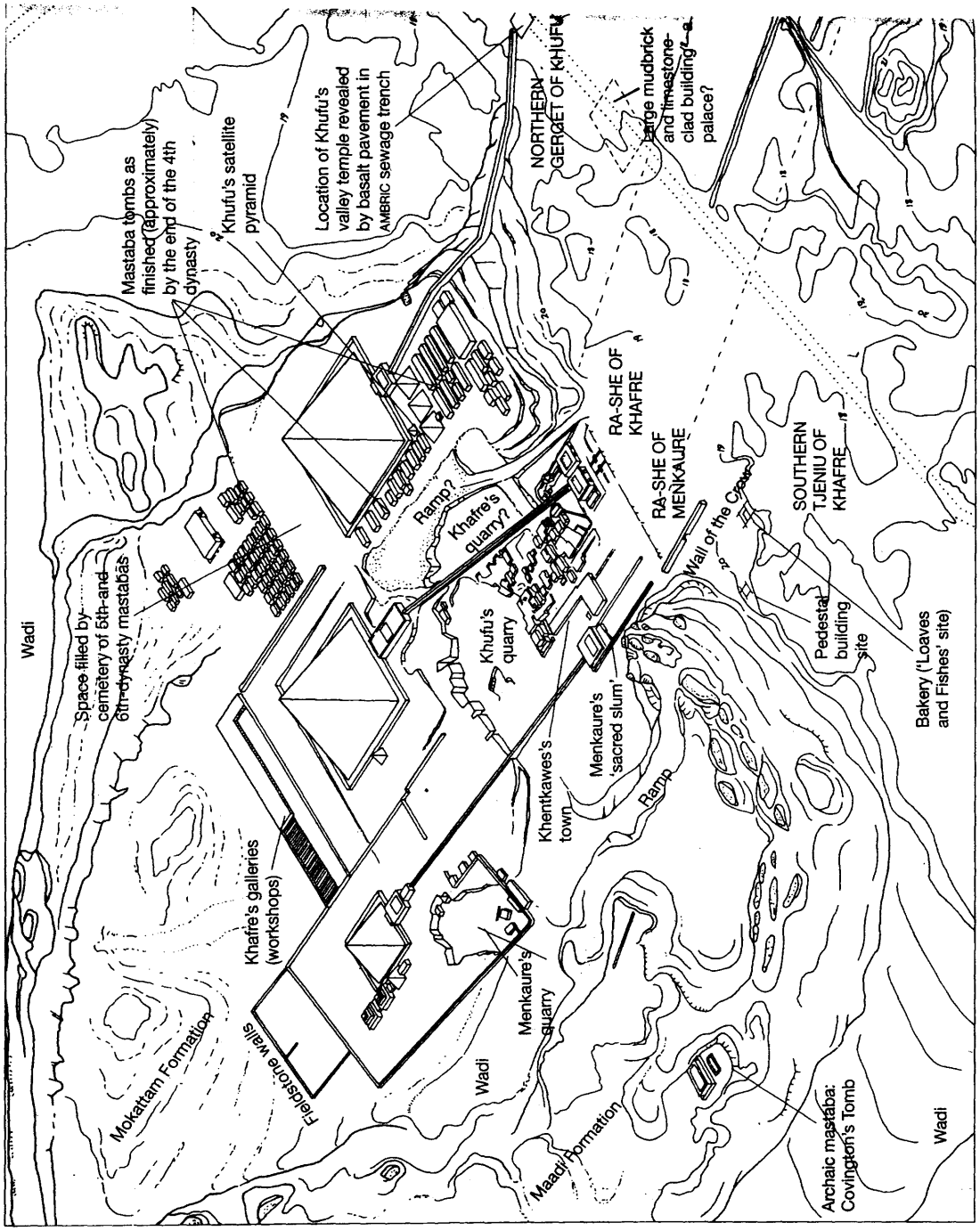


Figure 32: Giza settlement site: area of excavation
(Lehner 2001b)

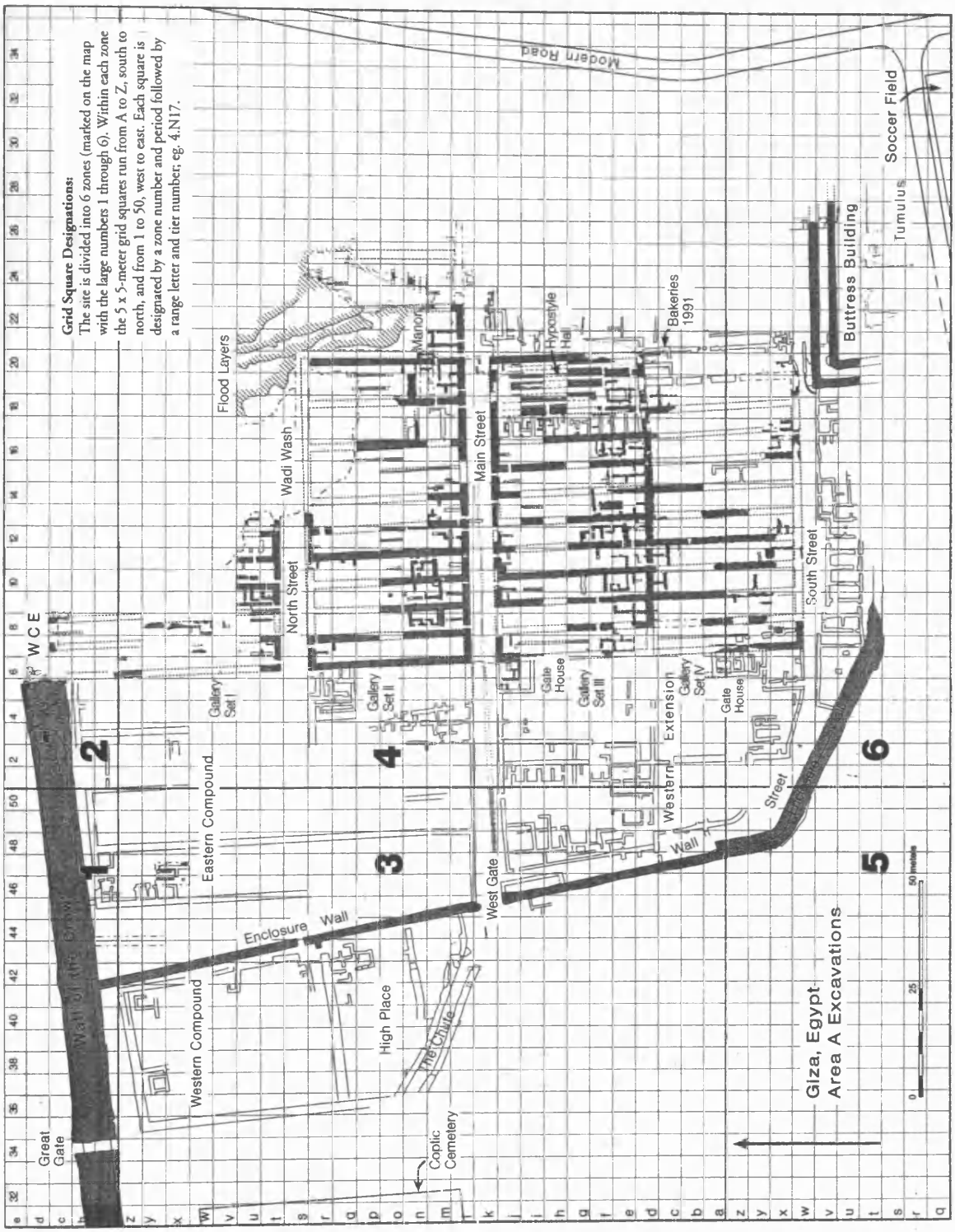


Figure 33: Lahun settlement site
(Kemp 1989: 150)

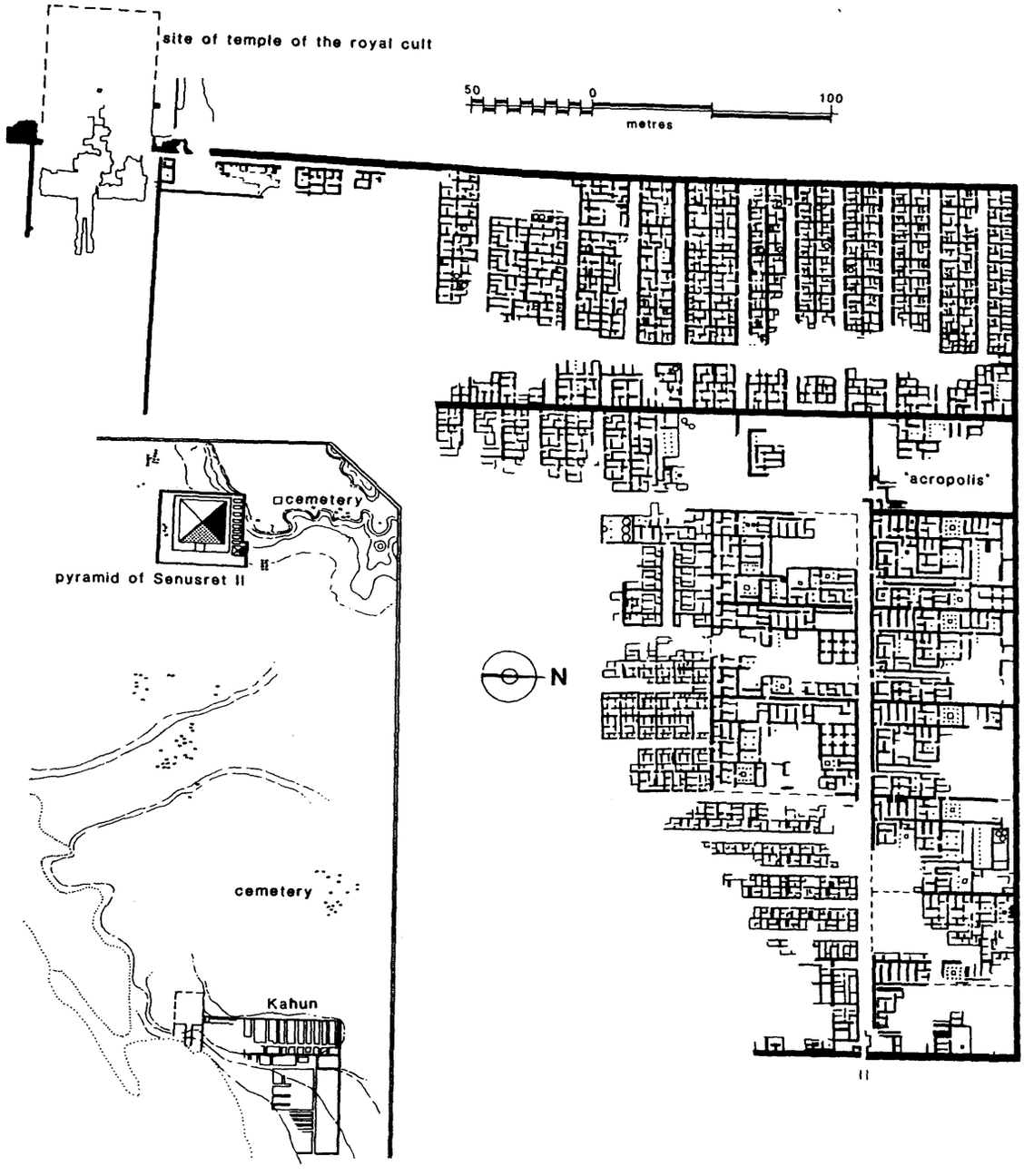


Figure 34: Amarna workmens' village
(Meskell 2002: 43)

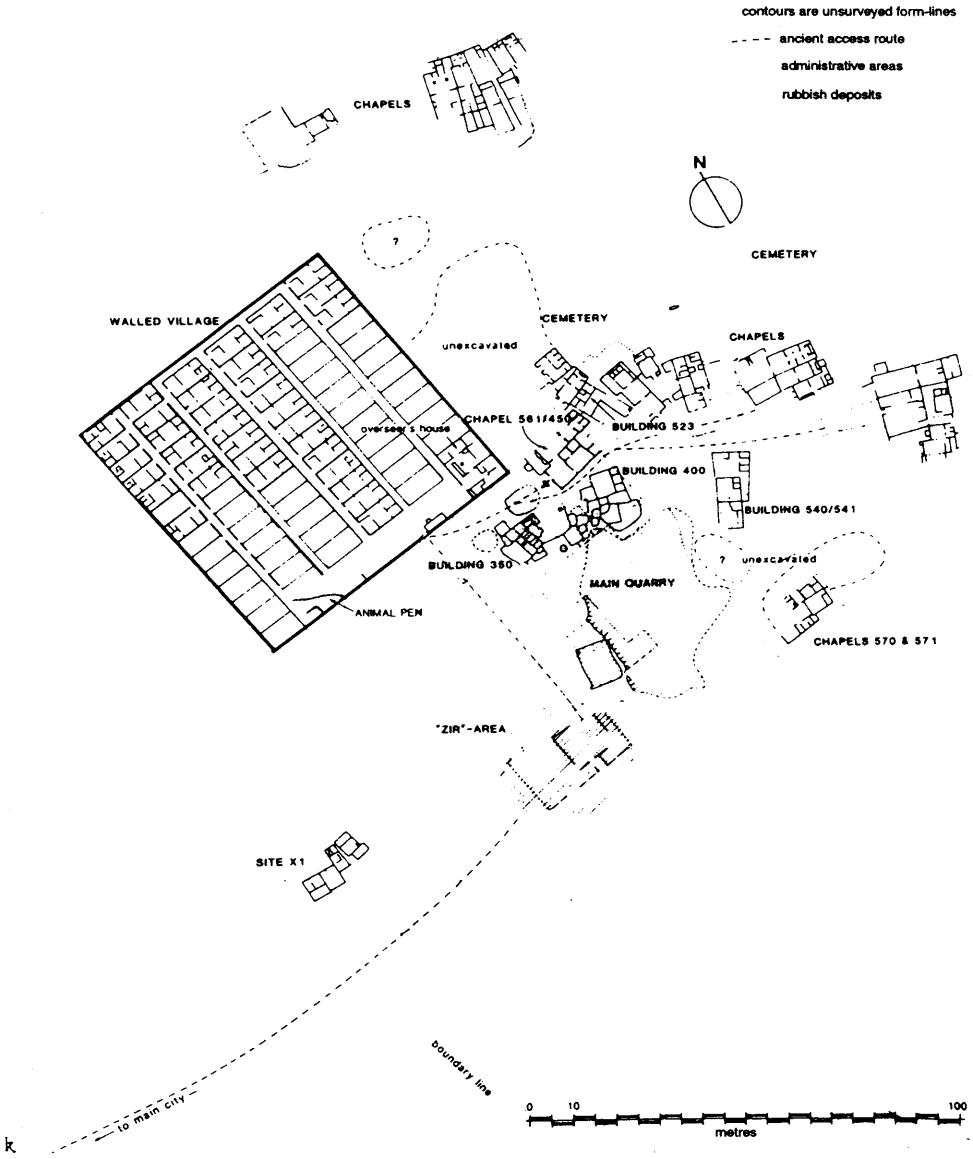


Figure 35: Kom Rabiʿa
(Meskell 2002: 35)

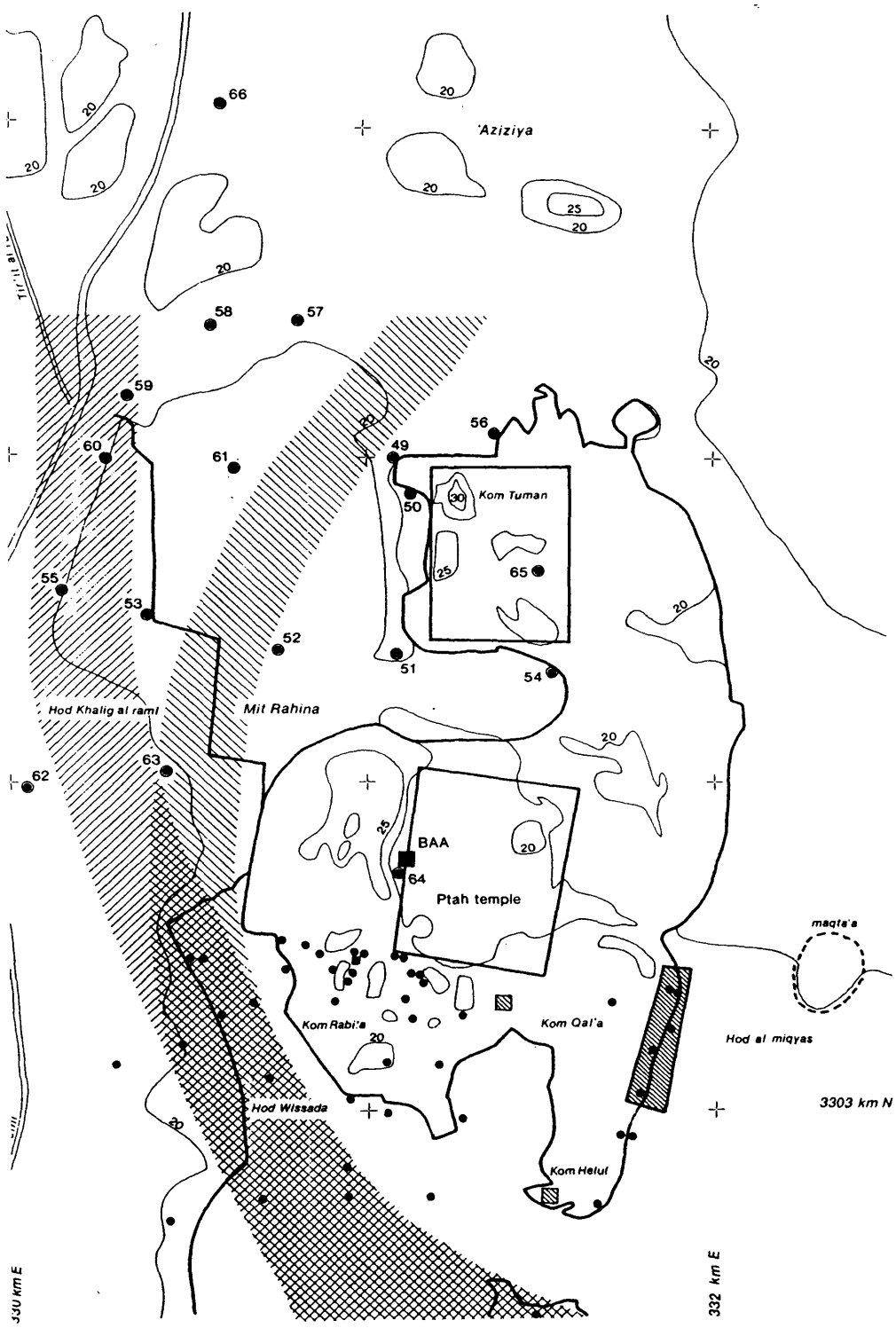
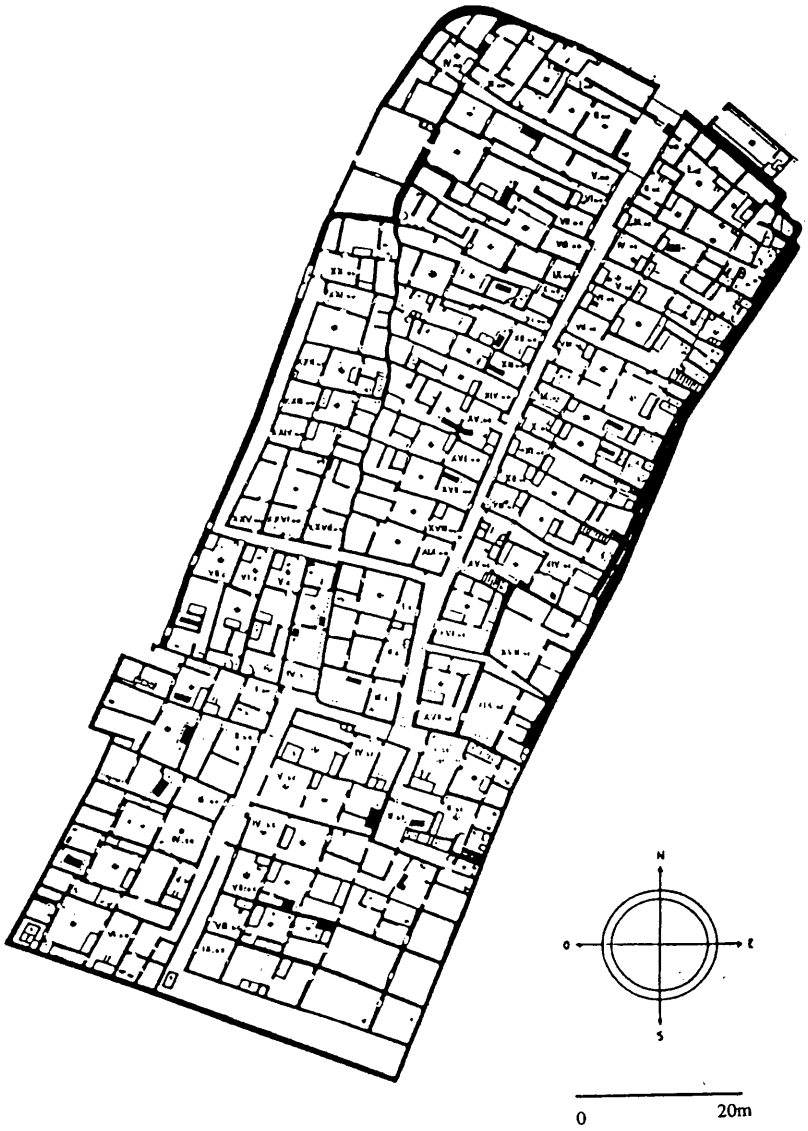


Figure 36: Deir el-Medina
(Meskell 2002: 42)



Glossary

Definitions based on extracts from Walton *et al* 1994

Ankylostomiasis	Infestation of the human intestine with hook worm, causing malnutrition and severe anaemia. Infestation occurs through the skin when handling mud, where faeces with parasite are present. Particularly apposite to occupations where individuals handled mud such as brick and pottery manufacture
Dracuncula medinensis	Human infestation with guinea worm when water containing infected fleas is swallowed. Larvae penetrate the duodenal wall and develop in tissue spaces. The adult female worm migrates to the skin surface often of the lower leg to release eggs. The heat and irritation accompanying this process encourages immersion of the offending limb in water where eggs then infest the water fleas and the cycle is repeated. A common parasite in Africa and typically where access to water in wells requires wading.
Dwarfism	Under-development of skeleton due to malnutrition or endocrine disorder. Achondroplasia is associated with skeletal malformation
Elephantiasis	Swelling of skin and subcutaneous tissue predominantly in the lower limbs and genitalia where lymphatic drainage has been obstructed by the filarial worm.
Filaria	Parasite carried by mosquitoes and infiltrating the human lymphatic system
Genu recurvatum	Deformity of knee characterised by hyper-extension of joint
Genu varum	Deformity of knee characterised by bowing of leg
Immunology	Science identifying the human response to disease and subsequent immunity
Microbiology	Study of infectious organisms, prevention of disease and treatment
Palaeoserology	The study of antibodies extracted from human remains
Paraphimosis	Retraction of the prepuce behind the glans penis so that the tight ring of skin interrupts the circulation to the glans. Treatment requires circumcision to prevent a reoccurrence.

Schistosomiasis	Human infestation with bilharzia worm when parasite enters through skin whilst immersed in infested water. Anaemia results from bladder or intestinal involvement. Infestation is prevalent in slow moving fresh water specifically irrigation canals, the edges of the Nile and marshland. Advanced stages result in liver involvement and ascites manifesting as abdominal distension and genital hypertrophy
Talipes equino-varus	Congenital foot deformity commonly known as club foot
Trachoma	Clamydia infection carried in the genito-urinary tract which causes inflammation when in contact with eyes and subsequent blindness if untreated

Bibliography

Ackerknecht, E. H., 1965. *History and Geography of the most Important Diseases.* London: Hafner.

Adams, B., 1987. *The Fort Cemetery at Hierakonpolis.* London: K. P. I.

Adams, D., 1881. *Hippocrates on Airs, Waters and Places.* English Translation. London: Messrs. Wyman and Sons.

Adams, M. D., 1997. A Textual Window on the Settlement System in Ancient Egypt. In Lustig. J. (ed), *Anthropolgy and Egyptology: a Developing Dialogue.* Sheffield: Sheffield Academic Press: 90-105.

Allen, W. L. and Richardson, J. B., 1971. The Reconstruction of Kinship from Archaeological Data: the Concepts, the Method, and the Feasibility. *American Antiquity.* 36: 41-53.

Andrews, C. A., 1984. *Egyptian Mummies.* London: British Museum Press.

Andrews, C. A., 1990. *Ancient Egyptian Jewellery.* London: British Museum Press.

Andrews, C. A. R., 1994. *Amulets of Ancient Egypt.* London: British Museum Press.

Anthes, R., 1928. *Die Felseninschriften von Hatnub.* Leipzig: Hinrichs.

Armelagos, G. C. and Mills J. O., 1993. Paleopathology as Science: the Contribution of Egyptology. In Davies, W. V. and Walker, R. (eds), *Biological Anthropology and the Study of Ancient Egypt.* London: British Museum Press: 1-18.

Arnold, D., 1991. *Building in Egypt: Pharaonic Stone Masonry.* Oxford: Oxford University Press.

Arnold, D., 1993. Techniques and Traditions of Manufacture in the Pottery of Ancient Egypt. In Arnold, D. and Bourriau, J. D. (eds), *An Introduction to Ancient Egyptian Pottery.* Mainz: Von Zabern: 11-102.

Arnold, D. and Bourriau, J. (eds), 1993. *An Introduction to Ancient Egyptian Pottery.* Mainz: Von Zabern.

Arnold, F., 1990. *The South Cemeteries of Lisht. Volume 2: the Control Notes and Team Marks.* New York: The Metropolitan Museum of Art.

Arnold, J. E., 2000. Revisiting Power, Labour Rights and Kinship: Archaeology and Social Theory. In Schiffer, M. B. (ed), *Social Theory in Archaeology.* Utah: University of Utah Press: 14-30.

Assmann, J., 1989. State and Religion in the New Kingdom. In Simpson, W. K. (ed), *Religion and Philosophy in Ancient Egypt.* New Haven: Yale Egyptological Studies 3: 55-88.

Assmann, J., 1996. Preservation and Presentation of Self in Ancient Egyptian Portraiture. In Der Manuelian, P. (ed), *Studies in Honor of William Kelly Simpson. Volume 1.* Boston: Museum of Fine Arts: 55-81.

Aston, B., 1994. Ancient Egyptian Stone Vessels: Materials and Forms. *Studien zur Archäologie und Geschichte Altägyptens 5.* Heidelberg: Heidelberger Orientverlag.

Aston, B., Harrell, J. A. and Shaw, I., 2000. Stone. In Nicholson, P. T. and Shaw, I. (eds), *Ancient Egyptian Materials and Technology.* Cambridge: Cambridge University Press: 5-77.

Aston, D. A., 1999. Third Intermediate Period, Overview. In Bard, K. A. (ed), *Encyclopedia of the Archaeology of Ancient Egypt.* London and New York: Routledge: 62-65.

Badawy, A., 1966. *A History of Egyptian Architecture. Volume 2.* California: University of California Press.

Badawy, A., 1967. The Civic Sense of Pharaoh and Urban Development in Ancient Egypt. *Journal of the American Research Center in Egypt.* 6: 103-109.

Baer, K., 1960. *Rank and Title in the Old Kingdom: the Structure of the Egyptian Administration in the Fifth and Sixth Dynasties.* Chicago: University of Chicago Press.

Baer, K., 1963. An 11th Dynasty Farmer's Letter to his Family. *Journal of the American Oriental Society.* 83: 1-19.

Baines, J., 1982. Interpreting Sinuhe. *Journal of Egyptian Archaeology.* 68: 31-44.

Baines, J., 1983. Literacy and Ancient Egyptian Society. *Man.* (New Series). 18: 572-599.

Baines, J., 1984. Interpretations of Religion: Logic, Discourse, Rationality. *Göttinger Miszellen.* 76: 25-54.

Baines, J., 1987. Practical Religion and Piety. *Journal of Egyptian Archaeology.* 73: 79-98.

Baines, J., 1990a. Interpreting the Story of the Shipwrecked Sailor. *Journal of Egyptian Archaeology.* 76: 55-72.

Baines, J., 1990b. Restricted Knowledge, Hierarchy and Decorum: Modern Perceptions and Ancient Institutions. *Journal of the American Research Center in Egypt.* 27: 1-24.

Baines, J., 1991. Society, Morality and Religious Practice. In Schafer, B. E. (ed), *Religion in Ancient Egypt: Gods, Myths and Personal Practice.* London: Routledge: 123-200.

Baines, J., 1994. On the Status and Purposes of Ancient Egyptian Art. *Cambridge Archaeological Journal.* 4. 1: 67-94.

Baines, J., 1995. Kingship, Definition of Culture and Legitimation. In O'Connor, D. and Silverman, D. P. (eds), *Ancient Egyptian Kingship.* Leiden: E. J. Brill: 3-47.

Baines, J., 1999a. Feuds or Vengeance? Rhetoric and Social Forms. In Teeter, E. and Larson, J. A. (eds), *Gold of Praise. Studies on Ancient Egypt in Honor of Edward F. Wente.* Chicago: The Oriental Institute of the University of Chicago. Studies in Ancient Oriental Civilization. 58: 11-20.

Baines, J., 1999b. Forerunners of Narrative Biographies. In Leahy, A. and Tait, J. (eds), *Studies on Ancient Egypt in Honour of H. S. Smith.* London: Egypt Exploration Society: 23-37.

Baines, J. and Eyre, C. J., 1983. Four Notes on Literacy. *Göttinger Miszellen.* 61: 65-96.

Baker, B. J., 1997. Contributions of Biological Anthropology to the Understanding of Ancient Egyptian and Nubian Societies. In Lustig, G. (ed), *Anthropology and Egyptology. a Developing Dialogue.* Sheffield: Sheffield Academic Press: 106-116.

Bakir, A. el M., 1947. Slavery in Ancient Egypt. *Annales du Service des Antiquités de l'Égypte, Cahier.* 45: 135-143.

Bard, K., 1992. Towards an Interpretation of the Role of Ideology in the Evolution of Complex Society in Egypt. *Journal of Anthropological Archaeology.* 11: 1-24.

Bard, K. A., 1994. *From Farmers to Pharaohs: Mortuary Evidence for the Rise of Social Complexity in Egypt.* Sheffield: Sheffield Academic Press.

Bard, K. A., 1999. Introduction. Geographic and Chronological Scope of Egyptian Archaeology. In Bard, K. A (ed), *Encyclopedia of the Archaeology of Ancient Egypt.* London and New York: Routledge: 1-5.

Barns, J. W. B., 1956. *Five Ramesseum Papyri.* Oxford: Griffith Institute.

Barrett, J. C., 1994. Defining Domestic Space in the Bronze Age of Southern Britain. In Parker Pearson, M. and Richards, C. (eds), *Architecture and Order. Approaches to Social Space.* London: Routledge: 87-97.

Batrawi, A., 1945. The Racial History of Egypt and Nubia. Part 1. The Craniology of Lower Nubia from Predynastic times to the Sixth Century AD. *Journal of the Royal Anthropological Institute.* 75: 181-201.

Batrawi, A., 1946. The Racial History of Egypt and Nubia. Part 2. The Racial Relationships of the Ancient and Modern Populations of Egypt and Nubia. *Journal of the Royal Anthropological Institute.* 76: 131-156.

Bennion, E., 1979. *Antique Medical Instruments.* London: Sotheby's Publications.

Bianchi, R. S., 1995. Ancient Egyptian Reliefs, Statuary and Monumental Paintings. In Sasson, J. (ed), *Civilizations of the Ancient Near East. Volume 4.* New York: Scribners: 2533-2554.

Bierbrier, M., 1982. *The Tomb-Builders of the Pharaohs.* London: British Museum Press.

Bietak, M., 1979. Urban Archaeology and the 'Town Problem'. In Weeks, K. (ed), *Egyptology and the Social Sciences.* Cairo: American University in Cairo Press: 97-144.

Bietak, M., 1996. *Avaris, the Capital of the Hyksos: Recent Excavations at Tell el-Dab'a.* London: British Museum Press.

Bietak, M., 1999. Second Intermediate Period, Overview. In Bard, K. A. (ed), *Encyclopedia of the Archaeology of Ancient Egypt.* London and New York: Routledge: 54-56.

Binford, L. R., 1992. Seeing the Present and Interpreting the Past and Keeping Things Straight. In Rossignol, J. and Wandsnider, L. (eds), *Space, Time and Archaeological Landscapes.* New York: Plenum Press: 43-59.

Birch, S., 1852. Upon a Historical Tablet of Rameses II, 19th Dynasty, Relating to the Gold Mines in Aethiopia. *Archaeologia.* 34: 354-391.

Blackden, M. W. and Willoughby, F. G., 1892. *Collection of Hieratic Graffiti from the Alabaster Quarry at Hatnub near Tell el-Amarna.* [Privately Printed].

Blackman, A. M., 1914. *The Rock Tombs of Meir. Part 1.* London: Egypt Exploration Society.

Blackman, A. M., 1915. *The Rock Tombs of Meir. Part 2.* London: Egypt Exploration Society.

Blackman, A. M., 1916. Libations to the Dead in Modern Nubia and Ancient Egypt. *Journal of Egyptian Archaeology.* 3: 31-34.

Blackman, A. M., 1924. *The Rock Tombs of Meir. Part 4.* London: Egypt Exploration Society.

Blackman, A. M., 1953. *The Rock Tombs of Meir. Part 6.* London: Egypt Exploration Society.

Blackman, A. M. and Apted, M. R., 1953. *The Rock Tombs of Meir. Part 5.* London: Egypt Exploration Society.

Blackman, W. S., 1927. *The Fellahin of Upper Egypt.* London: George G. Harrap.

Blouet, B. W., 1972. Factors Influencing the Evolution of Settlement Patterns. In Ucko, P. J., Tringham, R. and Dimbleby, G. W. (eds), *Man, Settlement and Urbanism.* London: Gerald Duckworth: 3-15.

Booth, G., 1814. *The Historical Library of Diodorus the Sicilian in Fifteen Books. Volume 1.* London: J. Davis.

Borghouts, J. F., 1978. *Ancient Egyptian Magical Texts.* Leiden: E. J. Brill.

Borghouts, J. F., 1982. Divine Intervention in Ancient Egypt and its Manifestation (*b3w*). In Demarée, R. J. and Janssen, J. J. (eds), *Gleanings from Deir el-Medina.* Leiden: Nederlands Instituut Voor Het Nabije Oosten: 1-70.

Borghouts, J. F., 1994. Magical Practices Among the Villagers. In Lesko. L. H. (ed), *Pharaoh's Workers. The Villagers of Deir el-Medina.* Ithaca: Cornell University Press: 119-130.

Bouchet-Bert, L., 1998. The Question of *Dqr* and Sterile Blades in P. Ebers 875. *Journal of Egyptian Archaeology.* 84: 224-228.

Bourchardt, L. and Ricke, H., 1980. *Die Wohnhäuser in Tell el-Amarna.* Berlin: D.O.G.

Bourriau, J., 1988. *Pharaohs and Mortals: Egyptian Art in the Middle Kingdom.* Catalogue by Bourriau, J. with a contribution by Quirke, S. Cambridge. Cambridge Univerity Press.

Bourriau, J., 2001. Change of Body Position in Egyptian Burials from the mid 12th Dynasty until the early 18th Dynasty. In Willems, H. (ed), *Social Aspects of Funerary Culture in the Egyptian Old and Middle Kingdoms.* Proceedings of the International Symposium held at Leiden University, 6th-7th June 1996. Leuven: Peeters Press: 1-20.

Bourriau, J. D., Nicholson, P. T. and Rose, P. J., 2000. Pottery. In Nicholson, P. N. and Shaw, I. (eds), *Ancient Egyptian Materials and Technology.* Cambridge: Cambridge University Press: 121-147.

Boyd, R., 1972. Urbanization, Morbidity and Mortality In Ucko, P. J., Tringham, R. and Dimbleby, G. W. (eds), *Man, Settlement and Urbanism.* London: Gerald Duckworth: 345-352.

Brandt-Rauf, P. W. and Brandt-Rauf, S. I., 1987. History of Occupational Medicine: Relevance of Imhotep and the Edwin Smith Papyrus. *British Journal of Industrial Medicine.* 44: 68-70.

Breasted, J. H., 1930. *The Edwin Smith Surgical Papyrus. Volume 1. Hieroglyphic Transliteration, Translation and Commentary.* Chicago: University of Chicago Press.

Breasted, J. H., 1948. *Egyptian Servant Statues.* The Bollingen Series. Washington: Pantheon.

Brooks, A. S. and Yellen, J. E., 1987. The Preservation of Activity Areas in the Archaeological Record: Ethnoarchaeological and Archaeological Work in Northwest Ngamiland, Botswana. In Kent, S. (ed), *Method and Theory for Activity Area Research.* New York: Columbia University Press: 63-106.

Brothwell, D. R., 1969. Dietary Variation and the Biology of Earlier Human Populations. In Ucko, P. J. and Dimbleby, G. W. (eds), *The Domestication and Exploitation of Plants and Animals.* London: Gerald Duckworth: 531-545.

Brothwell, D. R., 1972. Community Health as a Factor in Urban Cultural Evolution. In Ucko, P. J., Tringham, R. and Dimbleby, G. W. (eds), *Man, Settlement and Urbanism.* London: Gerald Duckworth: 353-361.

Brovarski, E., 1999a. Old Kingdom, Overview. In Bard, K. A. (ed), *Encyclopedia of the Archaeology of Ancient Egypt.* London and New York: Routledge: 36-41.

Brovarski, E., 1999b. First Intermediate Period, Overview. In Bard, K. A. (ed), *Encyclopedia of the Archaeology of Ancient Egypt.* London and New York: Routledge: 42-46.

Brunton, G. and Caton-Thompson, G., 1928. *The Badarian Civilisation and Predynastic Remains near Badari.* London: British School of Archaeology in Egypt.

Bruyère, M. B., 1924-1953. *Deir el Médina. 17 Volumes.* Cairo: Le Caire Imprimerie de l'Institut Français d'Archéologie Orientale.

Bruyère, M. B., 1939. *Rapport sur les Fouilles à Deir el Médina. (1934-1935). Volume 3.* Cairo: Le Caire Imprimerie de l'Institut Français d'Archéologie Orientale.

Bryan, C. P., 1930. *The Papyrus Ebers.* London: Geoffrey Bles.

Buikstra, J. E., Baker, B. J. and Cook, D. C., 1993. What Diseases Plagued the Ancient Egyptians? A Century of Controversy Considered. In Davies, W. V. and Walker, R. (eds), *Biological Anthropology and the Study of Ancient Egypt.* London: British Museum Press: 24-53.

Butzer, K. W., 1976. *Early Hydraulic Civilization in Egypt: a Study in Cultural Ecology.* Chicago: University of Chicago Press.

Butzer, K. W., 2001. When the Desert was in Flood.... Environmental History of the Giza Plateau. In Lehner, M. (ed), Footprint of the State! The City of the Pyramid Builders. *Aeragram: Newsletter of the Ancient Egyptian Research Associates.* 5: 1: 3-5.

Camilli, E. L. and Ebert, J. I., 1992. Artifact Reuse and Recycling in Continuous Surface Distributions and Implications for Interpreting Land Use Patterns. In Rossignol, J. and Wandsnider, L. (eds), *Space, Time and Archaeological Landscapes.* New York: Plenum Press: 113-136.

Capart. J., 1907. *Une Rue de Tombeaux à Saqqarah. 2 Volumes.* Brussels: Vromant.

Cave, A. J. E., 1939. The Evidence for the Incidence of Tuberculosis in Ancient Egypt. *The British Journal of Tuberculosis.* July 1939: 142-152.

Cerný, J., 1973. *A Community of Workmen at Thebes in the Ramesside Period.* Cairo: Institut Français d'Archéologie Orientale du Caire.

Chadwick, J. and Mann, W. N., 1950. *The Medical Works of Hippocrates.* Oxford: Blackwell Scientific Publications.

Chang, K. C. (ed), 1968. *Settlement Archaeology.* Palo Alto: National Press.

Chappaz, J. L., 1983. Working with gold in Ancient Egypt. *Aurum.* 14: 34-40.

Cherry, J. F., 1987. Power in Space: Archaeological and Geographical Studies of the State. In Wagstaff, J. M. (ed), *Landscape and Culture: Geographical and Archaeological Perspectives.* Oxford: Blackwell: 146-172.

Christophe, L., 1949. La Stèle de l'an III de Ramses IV au Ouâdi Hammâmât (No 12). *Bulletin de l'Institut Français d'Archéologie Orientale.* 48: 1-38.

Clarke, D. L., 1977. Spatial Information in Archaeology. In Clarke, D. L. (ed), *Spatial Archaeology.* London: Academic Press: 1-32.

Cohen, M. N., 1989. *Health and the Rise of Civilisation.* London: Yale University Press.

Colley, D. G., 1996. Ancient Egypt and Today: Enough Scourges to go Round. *Emerging Infectious Diseases.* 2. 4: 362-363.

Contis, G. and David, A. R., 1996. The Epidemiology of Bilharzia in Ancient Egypt: 5000 Years of Schistosomiasis. *Parasitology Today.* 12: 7: 253-255.

Couyat, J. and Montet, P., 1912-13. *Les Inscriptions Hiéroglyphiques et Hiératiques du Ouâdi Hammâmât.* Cairo. L'Institut Français d'Archaéologie Orientale du Caire. Mémoires Publiés par les Membres de l'Institut Français de Archaéologie Orientale du Caire. 34.

Crewe, W. and Haddock, D. R. W., 1985. *Parasites and Human Disease.* London: Edward Arnold.

Crowfoot, G. M., 1933. The Mat Weaver from the Tomb of Khety. *Ancient Egypt:* 93-99.

Dasen, V., 1993. *Dwarfs in Ancient Egypt and Greece.* Oxford: Clarendon Press.

Davey, T. H. and Lightbody, W. P. H., 1956. *The Control of Disease in the Tropics: a Handbook for Medical Practitioners.* London: H. K. Lewis.

David, A. R. (ed), 1979. *The Manchester Museum Mummy Project.* Manchester: Manchester Museum Press.

David, A. R., 1986. *The Pyramid Builders of Ancient Egypt. A Modern Investigation of Pharaoh's Workforce.* London: Routledge.

David, A. R., 1997. Disease in Egyptian Mummies: the Contribution of New Technologies. *Lancet:* 1760-1763.

David, A. R., 2000. Mummification. In Nicholson, P. N. and Shaw, I. (eds), *Ancient Egyptian Materials and Technology.* Cambridge: Cambridge University Press: 372-389.

David, A. R and Archbold, R., 2000. *Conversations with Mummies: New Light on the Ancient Egyptians.* London: Harper Collins.

Davide, D., 1973. Survey of the Skeletal and Mummy Remains of Ancient Egyptians in Research Collections. In Brothwell, D. R. and Chiarelli, B. A. (eds), *Population Biology of the Ancient Egyptians.* London and New York: Academic Press: 155-159.

Davies, B. G., 1997. *Egyptian Historical Inscriptions of the Nineteenth Dynasty.* Jonsered: Paul Åströms förlag.

Davies, N. de G., 1900-1901. *The Mastaba of Ptahhetep and Akhethetep at Saqqarah, 2 Volumes.* London: Egypt Exploration Fund.

Davies, N. de G., 1902. *The Rock Tombs of Deir el-Gebrâwi, Part 1.* London: Egypt Exploration Fund.

Davies, N. de G., 1913. *Five Theban Tombs.* London: Egypt Exploration Fund.

Davies, N. de G., 1917. *The Tomb of Nakht at Thebes.* New York: Metropolitan Museum of Art.

Davies, N. de G., 1920. *The Tomb of Antefoker.* London: Egypt Exploration Society.

Davies, N. de G., 1922. *The Tomb of Puyemre at Thebes, Volume 1.* New York: Metropolitan Museum of Art.

Davies, N. de G., 1923. *The Tombs of Two Officials of Thuthmosis I.* London: Egypt Exploration Society.

Davies, N. de G., 1925. *The Tomb of Two Sculptors at Thebes.* New York: Metropolitan Museum of Art.

Davies, N. de G., 1927. *Two Ramesside Tombs at Thebes.* New York: Metropolitan Museum of Art.

Davies, N. de G., 1930. *The Tomb of Ken-amun at Thebes.* New York: Metropolitan Museum of Art.

Davies, N. de G., 1943. *The Tomb of Rekh-mi-re at Thebes, 2 Volumes.* New York: Metropolitan Museum of Art.

Davies, N. de G., 1948. *Seven Private Tombs at Kurnah.* New York: Metropolitan Museum of Art.

Davies, N. de G. and Davies, N. M., 1923. *The Tombs of Two Officials of Tuthmosis the Fourth (Nos. 75 and 90). Theban Tomb Series.* London: Egypt Exploration Society.

Davies, V. and Friedman, R., 1998. *Egypt.* London: British Museum Press.

Davis, T. M., 1908. *The Tomb of Siphtah with the Tomb of Tîyi.* Reprinted 2001. London: Gerald Duckworth.

Davis, W., 1983. Artists and Patrons in Predynastic and Early Dynastic Egypt. *Studien zur Altägyptischen Kultur.* 10: 119-139.

Davis, W., 1989. *The Canonical Tradition in Ancient Egyptian Art.* Cambridge: Cambridge University Press.

Dawson, W. R., 1924. The Mouse in Egyptian and Later Medicine. *Journal of Egyptian Archaeology.* 10: 83-86.

Dawson, W. R., 1929. *Magician and Leech. A Study in the Beginnings of Medicine with Special Reference to Ancient Egypt.* London: Methuen.

De Bruyn, P., 1955. A Graffito of the Scribe Dhuthotpe, Reckoner of Gold, in the South-Eastern Desert. *Journal of Egyptian Archaeology.* 42: 121-122.

De Sélincourt, A., 1996 (Reprint). *Herodotus. The Histories.* London: Penguin.

De Wit, C., 1972. La Circoncision chez les Anciens Egyptiens. *Zeitschrift fur Agyptische Sprache.* 99: 41-48.

Deelder, A. M., Miller, R. L., De Jonge, N. and Krijger, F. W., 1990. Detection of the Schistosome Antigen in Mummies. *Lancet.* Jan-June: 724-725.

Delrue, P., 2001. The Predynastic Cemetery N7000 at Nag'a ed-Dêr. A re-evaluation. In Willems, H. (ed), *Social Aspects of Funerary Culture in the Egyptian Old and Middle Kingdoms.* Proceedings of the International Symposium held at Leiden University, 6th-7th June 1996. Leuven: Peeters Press: 21-66.

Demarée, R. J., 1983. *The 3ḫ iḳr n Rᶜ Stelae: on Ancestor Worship in Ancient Egypt.* Leiden: Nederlands Instituut voor het Nabije Oosten te Leiden.

Demarée, R. J. and Janssen, J. J. (eds), 1982. *Gleanings from Deir el-Medina.* Leiden: Nederlands Instituut Voor Het Nabije Oosten.

Derry, D. E., 1956. The Dynastic Race in Egypt. *Journal of Egyptian Archaeology.* 42: 80-85.

Desroches Noblecourt, C., Donadoni, S. and Edel, E., 1971. *Grand Temple d'Abou Simbel: la Bataille de Qadech.* Cairo: Centre d'Etudes et de Documentation sur l'Ancienne Égypte.

Dewar, E. R. and McBride, K. A., 1992. Remnant Settlement Patterns. In Rossignol, J. and Wandsnider, L. (eds), *Space, Time and Archaeological Landscapes.* New York: Plenum Press: 227-255.

Dixon, D. M., 1972. The Disposal of Certain Personal, Household and Town Waste in Ancient Egypt. In Ucko, P. J., Tringham, R. and Dimbleby, G. W. (eds), *Man, Settlement and Urbanism.* London: Gerald Duckworth: 647-650.

Douglas, M., 1972. Symbolic Orders in the Use of Domestic Space. In Ucko, P. J., Tringham, R. and Dimbleby, G. W. (eds), *Man, Settlement and Urbanism.* London: Gerald Duckworth: 513-521.

Drenkhahn, R., 1995. Artists and Artisans in Pharaonic Egypt. In Sasson, J. (ed), *Civilizations in the Ancient Near East. Volume 1.* New York: Scribners: 331-342.

Duell, P., 1938. *The Mastaba of Mereruka. 2 Volumes.* Chicago: University of Chicago Press.

Duerden, B. I., Reid, T. M. S. and Jewsbury, J. M., 1993. *Microbial and Parasitic Infection.* London: Edward Arnold.

Dzierzydray-Rogalski, T., 1986. Problems of Preservation of Ancient Mummies in Contemporary Egypt. In David, R. A. (ed), *Science in Egyptology.* Manchester: Manchester University Press: 91-96.

Earle, T., 1997. *How Chiefs Come to Power: The political Economy of Prehistory.* Stanford: Stanford University Press.

Ebbell, B., 1937. *The Papyrus Ebers. The Greatest Egyptian Medical Document.* Copenhagen: Levin and Munksgaard.

Edwards, A. B., 1982. *A Thousand Miles up the Nile.* London: Century Publishing.

Edwards, I. E. S., 1960. *Hieratic Papyri in the British Museum. 4th Series: Oracular Amuletic Decrees of the Late New Kingdom.* London: British Museum Press.

Eigner, D., 1999. Domestic Architecture, Evidence from Tomb Scenes. In Bard, K. A. (ed), *Encyclopedia of the Archaeology of Ancient Egypt.* London and New York: Routledge: 255-259.

Elliot Smith, G. E., 1908. The Most Ancient Splints. *British Medical Journal:* 1-17.

Elliot Smith, G. E., 1927. Report of the Bones Found in the Sarcophagus of Paraʿmessu. In Brunton, G. and Engelbach R. (eds), *Gurob.* London. British School of Archaeology: 24-26.

Elliot Smith, G. E. and Derry, D. E., 1910. Anatomical report. *Archaeological Survey of Nubia Bulletin.* 6. Cairo. National Printing Department.

Elliot Smith, G. E. and Dawson, W. R., 1924. *Egyptian Mummies.* Reprinted 1991. London: K. P. I.

Elliot Smith, G. E. and Wood Jones, F. W., 1910. Report on the Human Remains. *The Archaeological Report of Nubia: Report for 1907-1908.* Volume 2. Cairo. National Printing Department.

Emery, W. B., 1949. *Excavations at Saqqara: Great Tombs of the First Dynasty.* Cairo: Government Press.

Emery, W. B., 1961. *Archaic Egypt.* New York: Penguin.

Emery, W. B., 1963. Egypt Exploration Society: Preliminary Report on the Excavation at Buhen, 1962. *Kush.* 11: 116-120.

Emery, W. B., 1965. *Egypt in Nubia.* London: Hutchinson.

Engelbach, R., 1933. The Quarries of the Western Nubian Desert: a Preliminary Report. *Annals du Service des Antiquités de l'Égypte.* 33: 65-74.

Engelbach, R., 1938. The Quarries of the Western Nubian Desert and the Ancient Road to Tushka (survey expedition February 1930 under the direction of Mr G. W. Murray, Director of the Topographical Survey). *Annals du Service des Antiquités de l'Égypte.* 38: 369-390.

Erman, A. and Grapow, H., 1971 (Reprint). *Wörterbuch der Aegyptischen Sprache. 7 Volumes.* Berlin: Akademie Verlag.

Eyre, C. J., 1976. Fate, Crocodiles and the Judgement of the Dead. *Studien zur Altägyptischen Kultur.* 4: 103-114.

Eyre, C. J., 1980. *Employment and Labour Relations in the Theban Necropolis in the Ramesside Period.* Unpublished PhD Thesis: Oxford University.

Eyre, C. J., 1987a. Work and the Organisation of Work in the Old Kingdom. In Powell, M. A. (ed), *Labor in the Ancient Near East.* Connecticut: American Oriental Society: 5-48.

Eyre, C. J., 1987b. Work and the Organisation of Work in the New Kingdom. In Powell, M. A. (ed), *Labor in the Ancient Near East.* Connecticut: American Oriental Society: 167-222.

Eyre, C. J., 1995. The Agricultural Cycle, Farming and Water Management in the Ancient Near East. In Sasson, J. M. (ed), *Civilisations of the Ancient Near East. Volume 1.* New York: Scribners: 175-189.

Eyre, C. J., 1999. The Village Economy in Ancient Egypt. In Bowman, A. K. and Rogan, E. (eds), *Agriculture in Egypt: from Pharaonic to Modern Times.* Oxford: Oxford University Press.

Fábrega, H. Jr., 1997. *Evolution of Sickness and Healing.* Berkeley, Los Angeles: University of California Press.

Fagan, B. M., 1977. *The Rape of the Nile: Tomb Robbers, Tourists and Archaeologists.* London: MacDonald and Jane.

Fairclough, G., 1992. Meaningful Constructions – Spatial and Functional Analysis of Medieval Buildings. *Antiquity:* 66: 348-366.

Fakhry, A., 1952. *The Inscriptions of the Amethyst Quarries at Wadi el-Hudi.* Cairo: Government Press.

Faulkner, R. O., 1953. Egyptian Military Organisation. *Journal of Egyptian Archaeology.* 39: 32-47.

Faulkner, R. O., 1991 (Reprint). *A Concise Dictionary of Middle Egyptian.* Oxford: Griffith Institute.

Feacham, R., Mc Garry, M. and Mara, D. (eds), 1978. *Water, Wastes and Health in Hot Climates.* Chichester: Wiley.

Feigenbaum, A., 1957. Archaeological Evidence for the Occurrence of Regular Seasonal Opthalmias in Ancient Egypt. *J.A.N.U.S.* 46: 165-172.

Filer, J., 1995. *Disease.* London: British Museum Press.

Filer, J., 1997. Ancient Egypt and Nubia as a Source of Information for Violent Cranial Injuries. In Carmen, J. (ed), *Material Harm: Archaeological Studies of War and Violence.* Glasgow: Cruithne Press: 47-74.

Finnestad, R. B., 1989a. Egyptian Thought about Life as a Problem of Translation. In Englund, G. (ed), *The Religion of the Ancient Egyptians: Cognitive Structures and Popular Expressions.* Uppsala Studies in Ancient Mediterranean and Near Eastern Civilizations: Boreas 20. Sweden: Uppsala: 29-40.

Finnestad, R. B., 1989b. The Pharaoh and the 'Democratization' of the Post-mortem Life. In Englund, G. (ed), *The Religion of the Ancient Egyptians: Cognitive Structures and Popular Expressions.* Uppsala Studies in Ancient Mediterranean and Near Eastern Civilizations: Boreas 20. Sweden: Uppsala: 89-93.

Firth, C. M., 1912. *The Archaeological Survey of Nubia. Report for 1908-1909. Volume 1.* Cairo: Government Press.

Fischer, H. G., 1959. An Example of Memphite Influence in a Theban Stela of the Eleventh Dynasty. *Artibus Asiae.* 22. 3: 240-252.

Fischer, H. G., 1961. The Nubian Mercenaries of Gebelein During the First Intermediate Period. *Kush.* 9: 44-80.

Fischer, H. G., 1979. *Ancient Egyptian Calligraphy: a Beginners Guide to Writing Hieroglyphs.* New York: Metropolitan Museum of Art.

Fischer, H. G., 1985. *Egyptian Titles of the Middle Kingdom.* New York: Metropolitan Museum of Art.

Fletcher, R., 1977. Settlement Studies (micro and semi-micro). In Clarke, D. L. (ed), *Spatial Archaeology.* London: Academic Press.

Fletcher, R., 1981. People and Space: a Case Study in Material Behaviour. In Hodder, I., Isaac, G. and Hammond, N. (eds), *Patterns of the Past: Studies in Honour of David Clarke.* Cambridge: Cambridge University Press: 97-128.

France, P., 1991. *The Rape of Egypt: How the Europeans Stripped Egypt of its Heritage.* London: Barrie and Jenkins.

Frandsen, P. J., 1992. The Letter to Ikhtay's Coffin: O. Louvre Inv. No. 698. In Demarée, R. J. and Egberts, A. (eds), *Village Voices: Proceedings of the Symposium 'Texts from Deir el-Medina and their Interpretation'* Leiden: Centre of Non-Western Studies: 31-49.

Frandsen, P. J., 1997. On Categorization and Metaphorical Structuring: Some Remarks on Egyptian Art and Language. *Cambridge Archaeological Journal.* 7. 1: 71-104.

Frey, R. A., 2000. A New Look at Illahun. In *Abstracts of Papers for the Eighth International Congress of Egyptologists:* 65.

Friedman, F. D., 1994. Aspects of Domestic Life and Religion. In Lesko, L. H. (ed), *Pharaoh's Workers. The Villagers of Deir el-Medina.* Ithaca: Cornell University Press: 95-117.

Fuchs, J., 1964. Physical Alterations Which Occur in the Blind and are Illustrated in Ancient Egyptian Works of Art. *Annals of the New York Academy of Science.* 117: 618-623.

Gale, R., Gasson, P., Hepper, P. and Killen, G., 2000. Wood. In Nicholson, P. N. and Shaw, I. (eds), *Ancient Egyptian Materials and Technology.* Cambridge: Cambridge University Press: 334-371.

Gallagher, N. E., 1990. *Egypt's Other Wars: Epidemics and Politics of Public Health.* Syracuse: Syracuse University Press.

Gardiner, A. H., 1935. *The Attitude of the Ancient Egyptians to Death and the Dead.* Cambridge: Cambridge University Press.

Gardiner, A. H., 1941. Ramesside Texts Relating to the Taxation and Transportation of Corn. *Journal of Egyptian Archaeology.* 27: 19-73

Gardiner, A. H., 1948a. *The Wilbour Papyrus. Volume 2: Commentary.* Oxford: Oxford University Press.

Gardiner, A. H., 1948b. *The Wilbour Papyrus. Volume 3: Translation.* Oxford: Oxford University Press.

Gardiner, A. H., 1955. *The Ramesseum Papyri Plates.* Oxford: Griffith Institute.

Gardiner, A. H., 1994 (Reprint). *Egyptian Grammar.* 3rd Edition. Oxford: Griffith Institute.

Gardiner, A. H., Peet, T. E. and Cerný, J., 1952-55. *The Inscriptions of Sinai.* 2nd Edition, 2 parts. London: Egypt Exploration Society.

Gardiner, A. H. and Sethe, K., 1928. *Egyptian Letters to the Dead: Mainly from the Old and Middle Kingdoms.* London: Egypt Exploration Society.

Garstang, J., 1907. *The Burial Customs of Ancient Egypt, as Illustrated by Tombs of the Middle Kingdom.* London: Constable.

Gasse, A., 1992. Les Ostraca Hiératiques Littéraires de Deir el-Medina: Nouvelles Orientations de la Publication. In Demarée, R. J. and Egberts, A. (eds), *Village Voices: Proceedings of the Symposium 'Texts from Deir el-Medina and their Interpretation'* Leiden: Centre of Non-Western Studies: 51-70.

Ghaleb, B., 1995. Choice Cuts: Butchery Practices at New Kingdom Memphis. *Egyptian Archaeology.* 7: 23-25.

Ghalioungui, P., 1962. Some Body Swellings Illustrated in Two Tombs of the Ancient Empire and their Possible Relation to ÂAÂ. *Zeitschrift für Ägyptische Spräche.* 87: 108-114.

Ghalioungui, P., 1973. *The House of Life: per Ankh, Magic and Medical Science in Ancient Egypt.* 2nd Edition. Amsterdam: B. M. Israël.

Ghalioungui, P., 1983. *The Physicians of Pharaonic Egypt.* Cairo: Deutsches Archäologisches Institut.

Ghalioungui, P., 1987. *The Ebers Papyrus: a New English Translation, Commentaries and Glossaries.* Cairo: Academy of Scientific Research and Technology.

Giddy, L. L., 1987. *Egyptian Oases: Bahariya, Dakhla, Farafra and Kharga during Pharaonic Times.* Warminster. Aris and Phillips.

Giddy, L., 1999a. The Present State of Egyptian Archaeology. In Leahy, A. and Tait, J. (eds), *Studies on Ancient Egypt in Honour of H. S. Smith.* London: Egypt Exploration Society: 109-113.

Giddy, L., 1999b. *The Survey of Memphis II. Kom Rabi'a: the New Kingdom and Post - New Kingdom Objects.* London. Egypt Exploration Society.

Giddy, L. and Jeffreys, D., 1993. The People of Memphis. *Egyptian Archaeology.* 3: 18-20.

Giddy, L., Smith, H. S. and French, P. G., 1992. *The Anubieion at Saqqâra II: the Cemeteries.* London: Egypt Exploration Society.

Gilbert, A. S., 1988. Zooarchaeological Observations on the Slaughterhouse of Meketre. *Journal of Egyptian Archaeology.* 74: 69-89.

Gnivecki, P. L., 1987. On the Quantitative Derivation of Household Spatial Organization from Archaeological Residues in Ancient Mesopotamia. In Kent, S. (ed), *Method and Theory for Activity Area Research.* New York: Columbia University Press: 176-235.

Goedicke, H., 1959. A New Inscription from Hatnub. *Annales du Service des Antiquités de l'Égypte.* 56: 55-58.

Goedicke, H., 1967. *Königliche Dokumente aus dem Alten Reich.* Wiesbaden: Harrassowitz.

Goedicke, H., 1968. Four Hieratic Ostraca of the Old Kingdom. *Journal of Egyptian Archaeology.* 54: 23-30.

Goedicke, H., 1970. The Story of the Herdsman. *Chronique d'Égypte.* 89-90: 244-266.

Goedicke, H., 1985. The 'Battle of Kadesh': a Reassessment. In Goedicke, H. (ed), *Perspectives on the Battle of Kadesh.* Baltimore: Halgo: 77-121.

Goubert, J-P., 1987. Twenty Years On: Problems of Historical Methodology in the History of Health. In Porter, R. and Wear, A. (eds), *Problems and Methods in the History of Medicine.* London: Croom Helm: 40-56.

Goudsmit, J., Dekker, J., Smit, L., Kuiken, C., Geelan, J. and Perizonius, R., 1993. Analysis of Retrovirus Sequences in circa 5300 Years old Egyptian Mummy DNA Obtained via PCR Amplification and Molecular Cloning. In Davis, W. V. and Walker, R. (eds), *Biological Anthropology and the Study of Ancient Egypt.* London: British Museum Press: 91-97.

Goyon, G., 1957. *Nouvelles Inscriptions Rupestures du Wadi Hammamat.* Paris. Libraire d'Amérique et d'Orient Adrien-Maisonneuve.

Grapow, H., 1954. *Grundriss der Medizin der Alten Ägypter. Volume 1: Anatomie und Physiologie.* Berlin: Akademie-Verlag.

Grapow, H., 1955. *Grundriss der Medizin der Alten Ägypter. Volume 2: Von den Medizinischen Texten.* Berlin: Akademie-Verlag.

Grapow, H., 1956. *Grundriss der Medizin der Alten Ägypter. Volume 3: Kranker, Kankheiten und Arzt.* Berlin: Akademie-Verlag.

Griffith, F. Ll., 1898. *The Petrie Papyri: Hieratic Papyri from Kahun and Gurob. 2 Volumes.* London: Bernard Quaritch.

Grmek, M. D., 1998. The Concept of Disease. In Grmek, M. D. (ed), *Western Medical Thought from Antiquity to the Middle Ages.* Cambridge, Mass: Harvard University Press: 241-272.

Hall, R., 1986. *Egyptian Textiles.* Princes Risborough: Shire Publications.

Hare, R., 1967. The Antiquity of Diseases Caused by Bacteria and Viruses, a Review of the Problem from a Bacteriologist's Point of View. In Brothwell, D. R. and Sandison, A. T. (eds), *Diseases in Antiquity: a Survey of the Diseases, Injuries and Surgery of Early Populations.* Springfield; Illinois: Charles C. Thomas: 115-131.

Harer, W. B., 1993. Health in Pharaonic Egypt. In Davis, W. V. and Walker, R. (eds), *Biological Anthropology and the Study of Ancient Egypt.* London: British Museum Press: 19-23.

Harer, W. B., 1997. Book Review of Ancient Egyptian Medicine by J. F. Nunn. *Journal of the American Research Center in Egypt.* 34: 271.

Harpur, Y., 1987. *Decoration in Egyptian Tombs of the Old Kingdom. Studies in Orientation and Scene Content.* London: K.P.I.

Harrell, J. A., 1989. An inventory of Ancient Egyptian Quarries. *Newsletter of the American Research Center in Egypt.* 146: 1-7.

Harrell, J. A. and Brown, V. M., 1994. Chephren's Quarry in the Nubian Desert of Egypt. *Nubica.* 3/1: 43-57.

Harrell, J. A., Brown, V. M. and Salah Masoud, M., 2000. An Early Dynastic Quarry for Stone Vessels at Gebel Manzal el-Seyl, Eastern Desert. *Journal of Egyptian Archaeology.* 86: 33-42.

Harris, J. G., 1999. Mummies, Scientific Study of. In Bard, K. A. (ed), *Encyclopedia of the Archaeology of Ancient Egypt.* London and New York: Routledge: 537-543.

Hartmann, F., 1887. *The Life of Paracelsus and the Substance of his Teachings.* London: George Redway.

Hassan, F. A., 1981. *Demographic Archaeology.* New York: Academic Press.

Hassan, F., 1993. Town and Village in Ancient Egypt. In Shaw, T., Sinclair, P., Andah, B. and Okpoko, A. (eds), *The Archaeology of Africa: Food, Metals and Towns.* London: Routledge: 551-609.

Hassan, S., 1955. The Causeway of Wnis at Sakkara. *Zeitschrift für Ägyptische Spräche.* 80: 136-144.

Hayden, B. and Cannon, A., 1983. Where the Garbage Goes: Refuse Disposal in the Maya Highlands. *Journal of Anthropological Archaeology.* 2: 117-163.

Hayes, W. C., 1955. (Reprint 1972). *A Papyrus of the Late Middle Kingdom in the Brooklyn Museum (Papyrus Brooklyn 35. 1446).* Edited and translated by Hayes, W. C. Brooklyn: Brooklyn Museum Press.

Hedges, R. E. M. and Sykes, B. A., 1993. The Extraction and Isolation of DNA from Archaeological Bone. In Davis, W. V. and Walker, R. (eds), *Biological Anthropology and the Study of Ancient Egypt.* London: British Museum Press: 98-103.

Helch, W., 1987. The Dissolution of the Palace Economy in the Ramesside Period. In Hagg, R. and Marinatos, M. (eds), *The Function of the Minoan Palaces.* Stockholm: Svenska Institutet i Athen: 17-19.

Hicks, R. M., 1983. The Canopic Worm: the Role of Bilharziasis in the Aetiology of Human Bladder Cancer. *Journal of the Royal Society of Medicine.* 76: 16-22.

Hillier, B. and Hansen, J., 1984. *The Social Logic of Space.* Cambridge: Cambridge University Press.

Hillson, S. W., 1979. Diet and Dental Disease. *World Archeology.* 11: 147-162.

Hillson, S. W., 1993. Histological Studies of Ancient Tooth Crown Surfaces. In Davis, W. V. and Walker, R. (eds), *Biological Anthropology and the Study of Ancient Egypt.* London: British Museum Press: 75-85.

Hillson, S. W., 1996. *Dental Anthropology.* Cambridge: Cambridge University Press.

Hodder, I., 1987. The Meaning of Discard: Ash and Domestic Space in Baringo. In Kent, S. (ed), *Method and Theory for Activity Area Research.* New York: Columbia University Press: 424-448.

Hodges, H. W. M., 1972. Domestic Building Materials and Ancient Settlements. In Ucko, P. J., Tringham, R. and Dimbleby, G. W. (eds), *Man, Settlement and Urbanism.* London: Gerald Duckworth: 523-530.

Hoffman, H., 1974. The Social Context of Trash Disposal in an Early Dynastic Town. *American Antiquity.* 39. 1: 35-50.

Hoffman, M. A., 1971-72. Preliminary Report on the First Two Seasons at Hierakonpolis. Part 3. Occupational Features at Kom el-Ahmar. *Journal of the American Research Center in Egypt.* 11: 35-47.

Hoffman, M. A., 1982. *The Predynastic of Hierakonpolis: an Interim Report.* Egyptian Studies Association Publication. Illinois: University of Western Illinois.

Holmes, D. L., 1999. El-Badari District Predynastic Sites. In Bard, K. A. (ed), *Encyclopedia of the Archaeology of Ancient Egypt.* London and New York: Routledge: 161-164.

Hoover, H. C. and Hoover, L. H., 1950. *Georgius Agricola, De Re Metallica.* Translated from the first Latin Translation of 1556. New York: Dover.

Hope, C., 1987. *Egyptian Pottery.* Princes Risborough: Shire Publications.

Hope, C., 1993. Pottery kilns from the Oasis of el-Dakhla. In Arnold, D. and Bourriau, J. (eds), *An Introduction to Ancient Egyptian Pottery.* Mainz: Von Zabern: 121-127.

Hornung, E., 1992. *Idea into Image. Essays on Ancient Egyptian Thought.* Translated by Bredeck, E. New York: Timken.

Hunter, D., 1978. *The Diseases of Occupations.* 6th Edition. London: Hodder and Stoughton.

Hurry, J. B., 2000. *Imhotep. The Vizier and Physician of King Zoser and Afterwards the Egyptian God of Medicine.* Special Edition. Revised. Oxford: Oxford University Press.

Hussein, F. H., Shabaan, S., Hawass, Z. and Sarry el-Din, A. M., 2000. Anthropological Differences between Workers and High Officials from Giza in the Old Kingdom. In *Abstracts of Papers for the Eighth International Congress of Egyptologists:* 88.

Ikram, S., 1995. *Choice Cuts: Meat Production in Ancient Egypt.* Leuven: Peeters and Departement Oosterse Studies.

Ikram, S., 2000. Meat Processing. In Nicholson, P. N. and Shaw, I. (eds), *Ancient Egyptian Materials and Technology.* Cambridge: Cambridge University Press: 656-671.

Ikram, S. and Dodson, A., 1998. *The Mummy in Ancient Egypt: Equipping the Dead for Eternity.* London: Thames and Hudson.

Isler, M., 1992. The Technique of Monolith Carving. *Mitteilungen des Deutschen Archäologischen Instituts Abteilung Kairo.* 48: 45-55.

Iverson, E., 1975. *Canon and Proportions in Egyptian Art.* 2nd Edition. Warminster: Aris and Phillips.

Jacobsen, F. F., 1998. *Theories of Sickness and Misfortune among the Hadandowa Beja of the Sudan.* London: Kegan Paul.

James, T. G. H., 1962. *The Hekanakhte Papers and other Early Middle Kingdom Documents.* Publication 19. New York: Museum of Metropolitan Art.

Janssen, J. J., 1975. *Commodity Prices from the Ramesside Period. An Economic Study of the Village of the Necropolis Workers at Thebes.* Leiden: E. J. Brill.

Janssen, J. J., 1980. Absence from work by the necropolis workers at Thebes. *Studien zur Altägyptischen Kultur.* 8: 127-152.

Janssen, J. J., 1992. Literacy and Letters at Deir el-Medina. In Demarée, R. J. and Egberts, A. (eds), *Village Voices: Proceedings of the Symposium 'Texts from Deir el-Medina and their Interpretation'* Leiden: Centre of Non-Western Studies: 81-94.

Janssen, R. M. and Janssen, J. J., 1996. *Getting Old in Ancient Egypt.* London: The Rubicon Press.

Jeffreys, D., Giddy, L., Bourriau, J., Smith, H. *et al.*, 1983-1996. Survey of Memphis. *Journal of Egyptian Archaeology.* 69-82.

Jeffreys, D. and Tait, J., 2000. Disability, Madness and Social Exclusion in Ancient Egypt. In Hubert, J. (ed), *Madness, Disability and Social Exclusion: the Archaeology and Anthropology of 'Difference'*. London: Routledge: 87-95.

Jones, K. and Moon, G., 1987. *Health, Disease and Society: a Critical Medical Geography*. London: Routledge and Kegan Paul.

Kadish, G. E., 1996. Observations on Time and Work-Discipline in Ancient Egypt. In Der Manuelian, P. (ed), *Studies in Honor of William Kelly Simpson. Volume 2.* Boston: Museum of Fine Arts: 439-449.

Kamel, S., 1946. Pterygium. Its Nature and a New Line of Treatment. *British Journal of Opthalmology*. 30: 549-563.

Kampp-Seyfried, F., 1999. Thebes Qurnet Murai. In Bard, K. A. (ed), *Encyclopedia of the Archaeology of Ancient Egypt*. London and New York: Routledge: 811-812.

Kanawati, N. and Hassan, A., 1997. *The Teti Cemetery at Saqqara. Volume 2. The Tomb of Ankhmahor*. Warminster: Aris and Phillips.

Kayser, H., 1964. *Die Mastaba des Uhemka: Ein Grab der Wüsta*. Hanover: Fachelträger-Verlag.

Kearns, G., 1989. Introduction. In Nelson, M. C. and Rogers, J. (eds), Urbanisation and the Epidemiological Tradition. *Meddelande från Familjehistoriska Projektet Historiska Institutionen Uppsala Universitet*. 9: 7-8.

Kearns, G., Lee, W. R. and Rogers, J., 1989. The Interaction of Political and Economic Factors in the Management of Urban Public Health. In Nelson, M. C. and Rogers, J. (eds), Urbanisation and the Epidemiological Tradition. *Meddelande från Familjehistoriska Projektet Historiska Institutionen Uppsala Universitet*. 9: 9-81.

Kemp, B. J., 1972a. Fortified Towns in Nubia. In Ucko, P. J., Tringham, R. and Dimbleby, G. W. (eds), *Man, Settlement and Urbanism*. London: Gerald Duckworth: 651-656.

Kemp, B. J., 1972b. Temple and Town in Ancient Egypt. In Ucko, P. J., Tringham, R. and Dimbleby, G. W. (eds), *Man Settlement and Urbanism*. London: Gerald Duckworth: 658-680.

Kemp, B. J., 1977. The Early Development of Towns in Egypt. *Antiquity*. 51: 185-200.

Kemp, B. J., 1983. Old Kingdom, Middle Kingdom and Second Intermediate Period. Circa 2686-1552 BC. In Trigger, B. G., Kemp, B. J., O'Connor, D. and Lloyd, A. B., (eds), *Ancient Egypt: a Social History*. Cambridge: Cambridge University Press: 71-182.

Kemp, B. J., 1984. In the Shadow of Texts: Archaeology in Egypt. *Archaeological Review from Cambridge:* 3: 2: 19-28.

Kemp, B, J., 1984-7. *Amarna Reports. 4 Volumes.* London: Egypt Exploration Society.

Kemp, B. J., 1986. Large Middle Kingdom Granary Buildings (and the Archaeology of Administration). *Zeitschrift für Ägyptische Spräche.* 113: 120-136.

Kemp, B. J., 1987. The Amarna Workmen's Village in Retrospect. *Journal of Egyptian Archaeology.* 73: 21-50.

Kemp, B. J., 1989. *Ancient Egypt: Anatomy of a Civilization.* London: Routledge.

Kemp, B. J., 1995a. How Religious were the Ancient Egyptians? *Cambridge Archaeological Journal.* 5: 25-54.

Kemp, B. J., 1995b. Site Formation Processes and the Reconstruction of House P46. 33. In Kemp, B. J. (ed), *Amarna Reports. VI.* London: Egypt Exploration Society.

Kemp, B. J., 2000. Soil (Including Mud-Brick Architecture). In Nicholson, P. N. and Shaw, I. (eds), *Ancient Egyptian Materials and Technology.* Cambridge: Cambridge University Press: 78-103.

Kemp, B. J. and Vogelsang-Eastwood, G., 2001. *The Ancient Textile Industry at Amarna.* London: Egypt Exploration Society.

Kent, S. (ed), 1987a. *Method and Theory for Activity Area Research.* New York: Columbia University Press.

Kent, S., 1987b. Understanding the Use of Space: an Ethnoarchaeological Approach. In Kent, S. (ed), *Method and Theory for Activity Area Research.* New York: Columbia University Press: 1-60.

Kent, S. (ed), 1990. *Domestic Architecture and the Use of Space: an Interdisciplinary and Cross-Cultural Study.* Cambridge: Cambridge University Press.

Keyes, E. L. and Keyes, E. L. Jr., 1903. *The Surgical Diseases of the Genito-Urinary Organs.* New York: D. Appleton.

Khalil, M., 1924a. The History and Progress of Anti-Ankylostomiasis and Anti-Bilharziasis Work in Egypt. In *Ankylostomiasis and Bilharziasis in Egypt.* Department of Public Health. Cairo: Cairo Government Press: 1-78.

Khalil, M., 1924b. The Control of Bilharziasis in Egypt. In *Ankylostomiasis and Bilharziasis in Egypt.* Department of Public Health. Cairo: Cairo Government Press: 95-158.

Khalil, M., 1924c. Parasitic Diseases at Saft el-Enab Village. In *Ankylostomiasis and Bilharziasis in Egypt.* Department of Public Health. Cairo: Cairo Government Press: 159-182.

Khalil, W. B., 1977. *Health and its Care in an Egyptian Hamlet: a Case Study in Medical Anthropology.* MA Thesis: U. S. International University.

Killen, G., 1994. *Egyptian Woodworking and Furniture.* Princes Risborough: Shire Publications.

King, S. H., 1962. *Perceptions of Illness and Medical Practice.* New York: Russell Sage Foundation.

Kitchen, K. A., 1991. Building the Ramasseum. *Cahiers de Recherche de l'Institut de Papyrologie et Égyptologie de Lille.* 13: 85-93.

Krause, A. C., 1933. Ancient Egyptian Ophthalmology. *Bulletin of the Institute of the History of Medicine.* 1: 258-276.

Krauss, R., 1983. Der Bildhauer Thutmose in Amarna. *Jahrbuch Preussischer Kulturbesitz.* 20: 119-132.

Kristensen, W. B., 1992. *Life out of Death: Studies in the Religions of Egypt and of Ancient Greece.* Louvain: Peeters Press.

Kuhnke, L., 1990. *Lives at Risk: Public Health in Nineteenth Century Egypt.* Berkeley: University of California Press.

Kus, S., 1982. Matters Material and Ideal. In Hodder, I. (ed), *Symbolic and Structural Archaeology.* Cambridge: Cambridge University Press: 47-62.
Lacovara, P., 1997. *The New Kingdom Royal City.* London: Kegan Paul.

Ladell, W. S. S., Waterlow, J. C. and Hudson, M. F., 1944. Desert Climate: Physiological and Clinical Observations. *Lancet.* 1944, ii: 491-497; 527-531.

Landers, J., 1993. *Death and the Metropolis: Studies in the Demographic History of London, 1670-1830.* Cambridge: Cambridge University Press.

Lane, E. W., 1860. *An Account of the Manners and Customs of the Modern Egyptians.* 5th Edition. London: John Murray.

Lansing, A., 1955. Foreward. In Winlock, H. E., *Models of Daily Life in Ancient Egypt from the tomb of Meket-Re at Thebes.* Cambridge, Massachusetts: Harvard University Press: V-VII.

Lawrence, A. W., 1965. Ancient Egyptian Fortifications. *Journal of Egyptian Archaeology.* 51: 69-94.

Layton, R., 1991. *The Anthropology of Art.* 2nd Edition. Cambridge: Cambridge University Press.

Leach, B. and Tait, J., 2000. Papyrus. In Nicholson, P. N. and Shaw, I. (eds), *Ancient Egyptian Materials and Technology.* Cambridge: Cambridge University Press: 227-253.

Leake, C. D., 1952. *The Old Egyptian Medical Papyri.* Kansas: University of Kansas Press.

Learmonth, A., 1978. *Patterns of Disease and Hunger.* London: David and Charles.

Leek, F. F., 1986a. Cheop's Courtiers: Their Skeletal Remains. In David, A. R. (ed), *Science in Egyptology.* Manchester: Manchester University Press: 183-200.

Leek, F. F., 1986b. Dental Health and Disease in Ancient Egypt with Special Reference to the Manchester Mummies. In David, R. A. (ed), *Science in Egyptology.* Manchester: Manchester University Press: 35-42.

Lehner, M., 1997a. *The Complete Pyramids.* London: Thames and Hudson.

Lehner, M., 1997b. The 1997 Field Season. *Aeragram: Newsletter of the Ancient Egyptian Research Associates.* 1: 2.

Lehner, M., 1998. The Big Leap Forward. *Aeragram: Newsletter of the Ancient Egyptian Research Associates.* 2: 2.

Lehner, M., 1999a. Pyramids (Old Kingdom), Construction of. In Bard, K. A. (ed), *Encyclopedia of the Archaeology of Ancient Egypt.* London and New York: Routledge: 639-646.

Lehner, M., 1999b. The Millennium Project. *Aeragram: Newsletter of the Ancient Egyptian Research Associates.* 3: 1.

Lehner, M., 2000a. Interim Report from the Field. *Aeragram: Newsletter of the Ancient Egyptian Research Associates.* 3: 2.

Lehner, M., 2000b. The First Year of the Millennium Project: Unveiling a Royal Plan. *Aeragram: Newsletter of the Ancient Egyptian Research Associates.* 4: 1.

Lehner, M., 2000c. Fractal House of Pharaoh: Ancient Egypt as a Complex Adaptive System, a Trial Formulation. In Kohler, T. A. and Gumerman, G. J. (eds), *Dynamics in Human and Primate Societies.* New York: Oxford University Press: 275-354.

Lehner, M., 2001a. Great Giza Galleries! Year Two of Millennium Project. *Aeragram: Newsletter of the Ancient Egyptian Research Associates.* 4: 2.

Lehner, M., 2001b. Footprint of the State! The City of the Pyramid Builders. *Aeragram: Newsletter of the Ancient Egyptian Research Associates.* 5: 1.

Leitz, C., 1999. *Hieratic Papyri in the British Museum. VII. Magical and Medical Papyri of the New Kingdom.* London: British Museum Press.

Leprohon, R. J., 1995. Royal Ideology and State Administration. In Sasson, J. (ed), *Civilizations of the Ancient Near East. Volume 1.* New York: Scribners: 273-287.

Lepsius, C. R., 1897-1913. *Denkmäler aus Äegypten und Äethiopen.* 2 Volumes. Leipzig: Hinrichs.

Lerstrup, A., 1992. The Making of Wine in Egypt. *Göttinger Miszellen.* 129: 61-82.

Lesko, B. S., 1994. Ranks, Roles and Rights. In Lesko, L. H. (ed), *Pharaoh's Workers. The Villagers of Deir el-Medina.* Ithaca: Cornell University Press: 15-39.

Lesko, L. H., 1994a. Literature, Literacy and Literati. In Lesko, L. H. (ed), *Pharaoh's Workers. The Villagers of Deir el-Medina.* Ithaca: Cornell University Press: 131-144.

Lesko, L. H. (ed), 1994b. *Pharaoh's Workers. The Villagers of Deir el-Medina.* Ithaca: Cornell University Press.

Levangie, P. K. and Norkin, C. C., 2001. *Joint Structure and Function: a Comprehensive Analysis.* 3rd Edition. Philadelphia: F. A. Davis Company.

Lichtheim, M., 1973. *Ancient Egyptian Literature, Volume 1: the Old and Middle Kingdoms.* Berkeley and Los Angeles: University of California Press.

Lichtheim, M., 1976. *Ancient Egyptian Literature, Volume 2: the New Kingdom.* Berkeley and Los Angeles: University of California Press.

Lichtheim, M., 1980. *Ancient Egyptian Literature, Volume 3: the Late Period.* Berkeley and Los Angeles. University of California Press.

Lichtheim, M., 1992. *Maat in Egyptian Autobiographies and Related Studies.* Schweiz: Universitätsverlag Freiburg Schweiz Vandenhoeck and Ruprecht Göttingen.

Lloyd, A. B., 1976. *Herodotus Book II: Commentary 1-98.* Leiden: E. J. Brill.

Lloyd, A. B., 1989. Psychology and Society in the Ancient Egyptian Cult of the Dead. In Simpson, W. K. (ed), *Religion and Philosophy in Ancient Egypt.* New Haven: Yale Egyptological Studies 3: 117-133.

Loebl, W. Y. and Nunn, J. F., 1997. Staffs as Walking Aids in Ancient Egypt and Palestine. *Journal of the Royal Society of Medicine.* 90. 8: 450-454.

Loprieno, A., 1996. Loyalty to the King, to God, to Oneself. In Der Manuelian, P. (ed), *Studies in Honor of William Kelly Simpson. Volume 2.* Boston: Museum of Fine Arts: 535-552.

Lorton, D., 1977. The Treatment of Criminals in Ancient Egypt Through the New Kingdom. *Journal of Economic and Social History of the Orient.* 20: 2-64.

Lucas, A., 1930. Cosmetics, Perfumes and Incense in Ancient Egypt. *Journal of Egyptian Archaeology.* 16: 41-53.

Lucas, A., 1962. *Ancient Egyptian Materials and Industries.* 4th Edition. Revised by J. R. Harris. London: Edward Arnold Ltd.

Luft, U., 1998. Toponyms at Lahun. In Quirke, S. (ed), *Lahun Studies.* Reigate: S. I. A. Publishing: 1-41.

MacCallan, A. F., 1913. *Trachoma and its Complications in Egypt.* Cambridge: Cambridge University Press.

Mackay, E., 1921. The Cutting and Preparation of Tomb-Chapels in the Theban Necropolis. *Journal of Egyptian Archaeology.* 7: 154-168.

Macramallah, R., 1935. *Fouilles à Saqqarah: le Mastaba d'Idout.* Cairo: Service des Antiquités de l'Egypte.

Manchester, K., 1983. *The Archaeology of Disease.* Bradford: University of Bradford.

Manniche, L., 1991. *Music and Musicians in Ancient Egypt.* London: British Museum Press.

Martin, G. T., 1991. *The Hidden Tombs of Memphis.* London: Thames and Hudson.

Masali, M. and Chiarelli, B., 1973. Demographic Data on the Remains of the Ancient Egyptians. In Brothwell, D. R. and Chiarelli, B. A. (eds), *Population Biology of the Ancient Egyptians.* London and New York: Academic Press: 161-169.

Maxfield, V. and Peacock, D., 2001. *The Roman Imperial Quarries. Survey and Excavation at Mons Porphyrites 1994-1998. Volume 1. Topography and Quarries.* London: Egypt Exploration Society.

McKeown, T., 1976. *The Modern Rise of Population.* London: Edward Arnold.

McLeod, W., 1982. *Self Bows and other Archery Tackle from the Tomb of Tutankhamun.* Oxford: Griffith Institute.

Meskell, L., 1994. Deir el-Medina in Hyperreality: Seeking the People in Pharaonic Egypt. *Journal of Mediterranean Archaeology.* 7 (2): 193-216.

Meskell, L., 1999. *Archaeologies of Social Life: Age, Sex and Class et cetera in Ancient Egypt.* Oxford: Blackwell.

Meskell, L., 2002. *Private Lives in New Kingdom Egypt.* Princeton and Oxford: Princeton University Press.

Meyer, C., 1998. Gold-Miners and Mining at Bir Umm Fawakhir. In Knapp, A. B., Pigott, V. C. and Herbert, E. W. (eds), *Social Approaches to an Industrial Past: the Archaeology and Anthropology of Mining.* London: Routledge: 259-275.

Miller, D., 1982. Artefacts as Products of Human Categorization Processes. In Hodder, I. (ed), *Symbolic and Structural Archaeology.* Cambridge: Cambridge University Press: 17-25.

Miller, R. L., 1984. Health Care on Field Projects. *Journal of Field Archaeology.* 11: 438-440.

Miller, R. L., 1989. *Dqr,* Spinning and the Treatment of the Guinea Worm in P. Ebers 875. *Journal of Egyptian Archaeology.* 75: 249-254.

Miller, R. L., 1990. Hogs and Hygiene. *Journal of Egyptian Archaeology.* 76: 125-140.

Miller, R. L., 1991a. Counting Calories in Egyptian Ration Texts. *Journal of the Economic and Social History of the Orient.* 34: 257-269.

Miller, R. L. 1991b. Palaeoepidemiology, Literacy, and Medical Tradition among Necropolis Workmen in New Kingdom Egypt. *Medical History.* 35: 1-24.

Miller, R. L., De Jonge, N., Krijger, F. W. and Deelder, A. M., 1993. Predynastic Schistosomiasis. In Davies, W. V. and Walker, R. (eds), *Biological Anthropology and the Study of Ancient Egypt.* London: British Museum Press: 54-60.

Mohr, H. T., 1943. *The Mastaba of Hetep-Her-Akhti: Study on an Egyptian Tomb Chapel in the Museum of Antiquities, Leiden.* Leiden: E. J. Brill.

Montet, P., 1925. Les Scènes de la Vie Privée dans les Tombeaux Égyptiens de l'Ancien Empire. *Publication de la Faculté des Lettres de l'Université de Strasbourg.* 24: 1-429.

Moodie, R. L., 1923. *Palaeopathology: an Introduction to the Study of Ancient Evidences of Disease.* Illinois: Illinois University Press.

Moore, H., 1982. The Interpretation of Spatial Patterning in Settlement Residues. In Hodder, I. (ed), *Symbolic and Structural Archaeology.* Cambridge: Cambridge University Press: 74-79.

Moran, W. L., 1992. *The Amarna Letters.* London: Johns Hopkins University Press.

Morenz, S., 1973. *Egyptian Religion.* Translated by Keep, A. E. London: Methuen.

Morschauser, S., 1985. Observations on the Speeches of Ramesses II in the Literary Record of the Battle of Kadesh. In Goedicke, H. (ed), *Perspectives on the Battle of Kadesh.* Baltimore: Halgo: 123-206.

Morschauser, S., 1991. *Threat-Formulae in Ancient Egypt: a Study of the History, Structure and Use of Threats and Curses in Ancient Egypt.* Baltimore: Halgo.

Morsy, S. A., 1993. *Gender, Sickness and Healing in Rural Egypt: Ethnography in Historical Context.* Boulder: Westview.

Moussa, A. M. and Altenmüller, H., 1971. *The Tomb of Nefer and Ka-hay.* Archäologische Veroffentlichungen 5. Mainz: Von Zabern.

Mueller, D., 1973. Three Mummy Labels in the Swansea Wellcome Collection. *Journal of Egyptian Archaeology.* 59: 175-180.

Murnane, W. J., 1975. A Note on the Personnel of the Sinai Expeditions under Amenemmes III. *Göttinger Miszellen.* 15: 27-33.

Murphy, E., 1985. *Diodorus Siculus: Diodorus on Egypt.* Jefferson, North Carolina: McFarland.

Murray, M. A., 2000. Cereal Production and Processing. In Nicholson, P. N. and Shaw, I. (eds), *Ancient Egyptian Materials and Technology.* Cambridge: Cambridge University Press: 505-536.

Murray, M. A., Boulton, N. and Heron, C., 2000. Viticulture and Wine Production. In Nicholson, P. N. and Shaw, I. (eds), *Ancient Egyptian Materials and Technology.* Cambridge: Cambridge University Press: 577-608.

Murray, P., 1980. Discard and Location: the Ethnographic Data. *American Antiquity:* 45: 490-502.

Naville, E., 1894. *The Temple of Deir el Bahri: its Plan, its Founders and its First Explorers.* London: Egypt Exploration Fund.

Naville, E., 1894-1908. *The Temple of Deir el-Bahri. 7 Volumes.* London: Egypt Exploration Fund.

Nelson, M. C., 2000, Abandonment: Conceptualization, Representation and Social Change. In Schiffer, M. B. (ed), *Social Theory in Archaeology.* Utah: University of Utah Press: 52-62.

Nelson, M. C. and Rogers, J. (eds), 1989. Urbanisation and the Epidemiological Tradition. *Meddelande från Familjehistoriska Projektet Historiska Institutionen Uppsala Universitet.* 9.

Newberry, P. E., 1893. *Beni Hassan: Part 1.* London: Egypt Exploration Society.

Newberry, P. E., 1894a. *Beni Hassan: Part 2.* London: Egypt Exploration Society.

Newberry, P. E., 1894b. *El-Bersha: the Tomb of Tehuti-hetep. Part 1.* London: Egypt Exploration Society.

Newell, R. R., 1987. Reconstruction of the Partitioning and Utilisation of Outside Space in the Late Prehistoric / Early Historic Inupiat Village. In Kent, S. (ed), *Method and Theory for Activity Area Research.* New York Columbia University Press: 107-175.

Nicholson, P., 1993. The Firing of Pottery. In Arnold, D. and Bourriau, J. D. (eds), *An Introduction to Ancient Egyptian Pottery.* Mainz: Von Zabern: 103-120.

Nicholson, P. N. and Henderson, J., 2000. Glass. In Nicholson, P. N. and Shaw, I. (eds), *Ancient Egyptian Materials and Technology.* Cambridge: Cambridge University Press: 195-224.

Nicholson, P. N. and Peltenburg, E., 2000. Egyptian Faience. In Nicholson, P. N. and Shaw, I. (eds), *Ancient Egyptian Materials and Technology.* Cambridge: Cambridge University Press: 177-194.

Nicholson, P. N. and Shaw, I. (eds), 2000. *Ancient Egyptian Materials and Technology.* Cambridge: Cambridge University Press.

Nims, C. F., 1958. The Bread and Beer Problems of the Moscow Mathematical Papyrus. *Journal of Egyptian Archaeology.* 44: 56-65.

Nordh, K., 1996. *Aspects of Ancient Egyptian Curses and Blessings: Conceptual Background and Transmission.* Uppsala Studies in Ancient Mediterranean and Near Eastern Civilizations: Boreas 26. Sweden: Uppsala.

Nunn, J. F., 1996. *Ancient Egyptian Medicine.* London: British Museum Press.

Nunn, J. F., 2001. Disease. In Redford, D. B. (ed), *The Oxford Encyclopaedia of Ancient Egypt. Volume 1.* Oxford: Oxford University Press: 396-401.

O'Connor, D., 1972. The Geography of Settlement in Ancient Egypt. In Ucko, P. J., Tringham, R. and Dimbleby, G. W. (eds), *Man, Settlement and Urbanism.* London: Gerald Duckworth: 681-698.

O'Connor, D., 1983. New Kingdom and Third Intermediate Period, 1552-664 BC. In Trigger B. G., Kemp, B. J., O'Connor, D. and Lloyd, A. B., (eds), *Ancient Egypt: a Social History.* Cambridge: Cambridge University Press: 183-278.

O'Connor, D., 1993. Urbanisation in Bronze Age Egypt and Northeast Africa. In Shaw, T., Sinclair, P., Andah, B. and Okpoko, A. (eds), *The Archaeology of Africa: Food, Metals and Towns.* London: Routledge: 570-587.

O'Connor, D., 1997. Ancient Egypt: Egyptological and Anthropological Perspectives. In Lustig, J. (ed), *Anthropology and Egyptology: a Developing Dialogue.* Sheffield: Sheffield Academic Press: 13-24.

Ogden, J., 2000. Metals. In Nicholson, P. N. and Shaw, I. (eds), *Ancient Egyptian Materials and Technology.* Cambridge: Cambridge University Press: 148-176.

Ortner, D. J. and Putschar, W. G. J., 1985. *Identification of Pathological Conditions in Human Skeletal Remains.* Washington: Smithsonian Institution Press.

Oswald, D. B., 1987. The Organization of Space in Residential Building: a Cross-Cultural Perspective. In Kent, S. (ed), *Method and Theory for Activity Area Research.* New York: Columbia University Press: 295-344.

Pääblo, S. and di Rienzo, A., 1993. A Molecular Approach to the Study of Egyptian History. In Davis, W. V. and Walker, R. (eds), *Biological Anthropology and the Study of Ancient Egypt.* London: British Museum Press: 86-90.

Page, A., 1983. *Ancient Egyptian Figured Ostraca.* Warminster: Aris and Phillips.

Pardey, E., 2001. Administration. In Redford, D. B. (ed), *The Oxford Encyclopaedia of Ancient Egypt. Volume 1.* Oxford: Oxford University Press: 12-20.

Parker Pearson, M. and Richards, C., 1994a. Ordering the World: Perceptions of Architecture, Space and Time. In Parker Pearson, M. and Richards, C. (eds), *Architecture and Order. Approaches to Social Space.* London: Routledge: 1-37.

Parker Pearson, M. and Richards, C., 1994b. Architecture and Order: Spatial Representation and Archaeology. In Parker Pearson, M. and Richards, C. (eds), *Architecture and Order. Approaches to Social Space.* London: Routledge: 38-72.

Parkinson, R. B., 1991. *Voices from Ancient Egypt: an Anthology of Middle Kingdom Writings.* London: British Museum Press.

Parkinson, R. B., 1997. *The Tale of Sinuhe and Other Ancient Egyptian Poems 1940-1640 BC.* Oxford: Clarendon Press.

Parkinson, R. B., 2002. *Poetry and Culture in Middle Kingdom Egypt: a Dark Side to Perfection.* London. Continuum.

Paulin-Grothe, E. and Schneider, T., 2001. New Workmen's Huts in the Valley of the Kings. *Egyptian Archaeology.* 19: 3-5.

Peck, W. H., 1996a. Methods of Representation. In Turner, J. (ed), *The Dictionary of Art.* London: Macmillan. 9: 798-799.

Peck, W. H., 1996b. Training, Workshop Practice and Organisation. In Turner, J. (ed), *The Dictionary of Art.* London: Macmillan. 9: 790-791.

Peck. W. H., 2001. Historical Sources: Archaeological and Artistic Evidence. In Redford, D. B. (ed), *The Oxford Encyclopaedia of Ancient Egypt. Volume 2.* Oxford: Oxford University Press: 101-104.

Peden, A. J., 1994. *The Reign of Ramesses IV.* Warminster: Aris and Phillips.

Peet, T. E., 1923. *The Rhind Mathematical Papyri: BM 10057 and 10058.* London: Hodder and Stoughton.

Peet, T. E., 1930. *The Great Tomb Robberies of the 20th Dynasty.* Oxford: Clarendon Press.

Petrie, W. M. F., 1890. *Kahun, Gurob and Hawara.* London: Kegan Paul, Trench and Trübner.

Petrie, W. M. F., 1891. *Illahun, Kahun and Gurob.* Warminster: Aris and Phillips.

Petrie, W. M. F., 1898. *Deshasheh 1897.* London: Egypt Exploration Fund.

Petrie, W. M. F., 1917. *Tools and Weapons: Illustrated by the Egyptian Collection in University College London.* London: British School of Archaeology in Egypt.

Petrie, W. M. F., 1927. *Objects of Daily Use.* London: British School of Archaeology in Egypt.

Pike, A. W., 1967. The Recovery of Parasite Eggs from Ancient Cesspit and Latrine Deposits: an Approach to the Study of Early Parasite Infections. In Brothwell, D. and Sandison, A. T. (eds), *Diseases in Antiquity: a Survey of the Diseases, Injuries and Surgery of Early Populations.* Springfield, Illinois: Charles C. Thomas: 184-188.

Pinch, G., 1994. *Magic in Ancient Egypt.* London: British Museum Press.

Polz, D., 1995. Excavations at Dra Abu el-Naga. *Egyptian Archaeology.* 7: 6-8.

Pons Mellado, E., 1995. Egyptian Mining in Sinai during the Middle Kingdom. In Eyre, C. (ed), *Abstracts of Papers Presented at the Seventh International Congress of Egyptologists, Cambridge, September 1995.* Oxford: Oxbow Books: 142-143.

Porter, B., Moss, R. L. B. and Málek, J., 1974-81. *Topographical Bibliography of Ancient Egyptian Hieroglyphic Texts, Reliefs and Paintings. 2nd Edition. Memphis.* Revised and Augmented by Málek, J. Oxford: Oxford University Press.

Powell, M. L., 1988. *Status and Health in Prehistory: a Case Study of the Moundville Chiefdom.* Washington and London: Smithsonian Institution Press.

Pusch, E. B., 1990. Metallverarbeitende Werkstätten der Frühen Ramessidenzeit in Qantir-Piramesse/Nord. *Ägypten und Levante.* 1: 75-113.

Quirke, S., 1990. *The Administration of Egypt in the Late Middle Kingdom: the Hieratic Documents.* New Malden: S. I. A.

Quirke, S., 1992. *Ancient Egyptian Religion.* London: British Museum Press.

Quirke, S., 1998. Preface: Word and Object, Problems of Translation. In Quirke, S. (ed), *Lahun Studies.* Reigate: S. I. A.: vii-viii.

Ralston, B. L., 1977. Medical Reinterpretation of Case Four of the Edwin Smith Surgical papyrus. *Journal of Egyptian Archaeology.* 63: 116-121.

Redding, R. W., 1994. *The Vertebrate Fauna from the Excavations at Kom el-Hisn.* Unpublished Report.

Redding, R. W., 2000. *The Faunal from Units Analyzed during the 2000 Field Season at the Work and Habitation Site Southeast of the Pyramids at Giza.* Unpublished Report.

Redford, D., 1999. New Kingdom, Overview. In Bard, K. A. (ed), *Encyclopedia of the Archaeology of Ancient Egypt.* London and New York: Routledge: 57-61.

Redford, D. B., 2001. Historical Sources: Textual Evidence. In Redford, D. B. (ed), *The Oxford Encyclopaedia of Ancient Egypt. Volume 2.* Oxford: Oxford University Press: 104-108.

Reeves, N. and Wilkinson, R. H., 1996. *The Complete Valley of the Kings: Tombs and Treasures of Egypt's Greatest Pharaohs.* London: Thames and Hudson.

Reisner, G. A., 1905. *The Hearst Medical Papyrus.* Leipzig: Hinrichs.

Reisner, G. A., 1932. *A Provincial Cemetery of the Pyramid Age: Naga-ᶜd-Dêr.* Volume 3. Oxford: Oxford University Press.

Richards, A., 1982. *Egypt's Agricultural Development, 1800-1980: Technical and Social Change.* Boulder, Colorado: Westview.

Richards, J. E., 1997. Ancient Egyptian Mortuary Practice and the Study of Socioeconomic Differentiation. In Lustig, J. (ed), *Anthropology and Egyptology: a Developing Dialogue.* Sheffield: Sheffield Academic Press: 33-42.

Richardson, R., 1987. *Death, Dissection and the Destitute.* London: Routledge and Kegan Paul.

Roberts, B. K., 1996. *Landscapes of Settlement: Prehistory to the Present.* London: Routledge.

Roberts, C. A., 2000. Did They Take Sugar? The Use of Skeletal Evidence in the Study of Disability in Past Populations. In Hubert, J. (ed), *Madness, Disability and Social Exclusion: the Archaeology and Anthropology of 'Difference'*. London: Routledge.

Roberts, C. and Manchester, K., 1995. *The Archaeology of Disease.* 2nd edition. New York: Cornell University Press.

Roberts, D., 1995. Rediscovering Egypt's Bread-making Technology. *National Geographic.* 187. 1: 32-35.

Robins, G., 1993. *Women in Ancient Egypt.* Cambridge: Harvard University Press.

Robins, G., 1994. *Proportion and Style in Ancient Egyptian Art.* London: Thames and Hudson.

Robins, G. and Shute, C., 1987. *The Rhind Mathematical Papyrus: an Ancient Egyptian Text.* London: British Museum.

Rogers, E. S., 1960. *Human Ecology and Health, an Introduction for Administrators.* New York: Macmillan.

Rogers, J. and Waldron, T., 1995. *A Field Guide to Joint Disease in Archaeology.* Chichester: John Wiley and Sons.

Rogers, J., Waldron, T., Dieppe, P. and Watt, L., 1987. Arthropathies in Palaeopathology: the Basis of Classification According to the most Probable Cause. *Journal of Archaeological Science.* 14: 179-193.

Rose, J. C., Armelagos, G. J. and Perry, L. S., 1993. Dental Anthropology of the Nile Valley. In Davies W. V. and Walker, R. (eds), *Biological Anthropology and the Study of Ancient Egypt.* London: British Museum Press: 61-74.

Rosen, G., 1943. *The History of Miner's Diseases: a Medical and Social Interpretation.* New York: Schuman's.

Roth, A. M., 1991. *Egyptian Phyles in the Old Kingdom: The Evolution of a System of Social Organisation.* Chicago: Oriental Institute of the University of Chicago.

Rouse, I., 1972. Settlement Patterns in Archaeology. In Ucko, P. J., Tringham, R. and Dimbleby, G. W. (eds), *Man, Settlement and Urbanism.* London: Gerald Duckworth: 96-107.

Rowling, J. T., 1986. Some Speculations on the Use and Decline of Surgery in Dynastic Egypt. In David, R. A. (ed), *Science in Egyptology.* Manchester: Manchester University Press: 399-412.

Ruffer, M. A., 1910. Note on the Presence of 'Bilharzia Haematobia' in Egyptian Mummies of the Twentieth Dynasty (1250-1000 BC). *British Medical Journal.* i: 16.

Ruffer, M. A., 1918. Arthritis Deformans and Spondylitis in Ancient Egypt. *Journal of Pathology and Bacteriology.* 22: 152.

Ruffer, M. A., 1921. *Studies in the Paleopathology of Egypt.* Chicago: University of Chicago Press.

Ruffer, M. A. and Ferguson, A. R., 1967. An Eruption Resembling that of Variola in the Skin of a Mummy of the Twentieth Dynasty (1200-1100 BC). In Brothwell, D. and Sandison, A. T. (eds), *Diseases in Antiquity: a Survey of the Diseases, Injuries and Surgery of Early Populations.* Springfield, Illinois: Charles C. Thomas: 346-348.

Sacks, K. S., 1990. *Diodorus Siculus and the First Century.* Princetown, New Jersey: Princetown University Press.

Sadek, A. I., 1980. *The Amethyst Mining Inscriptions at Wadi el-Hudi. Volume I: Text.* Warminster: Aris and Phillips.

Saffiro, L., 1973. Food and Dietary Habits in Ancient Egypt. In Brothwell, D. R., and Chiarelli, B. A. (eds), *Population Biology of the Ancient Egyptians.* London and New York: Academic Press: 297-305.

Saffiro, L., 1977. Razione e Salari in Natura Nell'antco Egitto. Considerazioni Dietetiche e Socio Economiche. *Aegyptus:* 57: 14-78.

Saleh, A. A., 1974. Excavations Around Mycerinus Pyramid Complex. *Mitteilungen des Deutschen Archäologischen Instituts Abteilung Kairo.* 30: 131-154.

Samuel, D., 1999. Bread Making and Social Interactions at the Amarna Workmen's Village. *World Archaeology.* 31 (1): 121-144.

Samuel, D., 2000. Brewing and Baking. In Nicholson, P. N. and Shaw, I. (eds), *Ancient Egyptian Materials and Technology.* Cambridge: Cambridge University Press: 537-576.

Sandison, A. T., 1967. Diseases of the Eye. In Brothwell, D. and Sandison, A. T. (eds), *Diseases in Antiquity: a Survey of the Diseases, Injuries and Surgery of Early Populations.* Springfied, Illinois: Charles C. Thomas: 457-463.

Sandison, A. T., 1973. Evidence of Infective Disease. In Brothwell, D. R. and Chiarelli, B. A. (eds), *Population Biology of the Ancient Egyptians.* London and New York: Academic Press: 213-224.

Sandwith, F. M., 1905. *The Medical Diseases of Egypt. Part 1.* London: H. Kimpton.

Sarry el-Din, A. M. and Hawass, Z., 1997. Discriminant Function Analysis for Sexing of Ancient Egyptian Long Bones. *The Journal of Legal Medicine and Forensic Sciences.* 9: 81-91.

Sarry el-Din, A. M. and Hawass, Z., 2000. Teeth Pathology in an Ancient Egyptian Sample from Giza: Old Kingdom. *Egyptian Dental Journal.* 46: 1533-1541.

Sarry el-Din, A. M., el Shafy, R. A. and Hawass, Z., 2000. Enamel Hypoplasia as a Stress Marker in Ancient Egyptians from Giza Old Kingdom. *Egyptian Dental Journal.* 46: 1871-1881.

Sarry el-Din, A. M., Zaki. M. E. and Hawass, Z., 1999. A Study of Vertebral Canal Dimensions in Ancient Egyptians from the Old Kingdom. *The Egyptian Journal of Anatomy.* 22: 201-216.

Satinoff, M. I., 1973a. Study of the Squatting Facets of the Talus and Tibia in Ancient Egyptians. In Brothwell, D. R. and Chiarelli, B. A. (eds), *Population Biology of the Ancient Egyptians.* London and New York: Academic Press: 209-212.

Satinoff, M. I., 1973b. The Medical Biology of the Early Egyptian Populations from Asswan, Assyut and Gebelen. In Brothwell, D. R. and Chiarelli, B. A. (eds), *Population Biology of the Ancient Egyptians.* London and New York: Academic Press: 233-257.

Sauneron, S., 1989. *Un Traité Égyptien d'Ophiologie.* Cairo: L'Institut Français d'Archéologie Orientale.

Schäfer, H., 1986. *Principles of Egyptian Art.* 1919. Translated by Baines, J. Oxford: Griffith Institute.

Scharff, A., 1924. Briefe aus Illahun. *Zeitschrift fur Agyptische Sprache.* 59: 20-51.

Scharff, A., 1937. Egyptian Portrait Sculpture. *Antiquity.* 11: 174-182.

Scheel, B., 1989. *Egyptian Metalworking and Tools.* Princes Risborough: Shire Publications.

Scheidel, W., 2001. *Death on the Nile: Disease and the Demography of Roman Egypt.* Leiden: E. J. Brill.

Schiffer, M. B., 1972. Archaeological Context and Systemic Context. *American Antiquity:* 37. 156-165.

Schultz, A. H., 1967. Notes on Diseases and Healed Fractures of Wild Apes. In Brothwell, D. and Sandison, A. T. (eds), *Diseases in Antiquity: a Survey of the Diseases, Injuries and Surgery of Early Populations.* Springfield, Illinois: Charles C. Thomas: 47-55.

Seidlmayer, S., 1996. Town and State in the Early New Kingdom: a View from Elephantine. In Spencer, J. (ed), *Aspects of Early Egypt.* London: British Museum Press: 108-127.

Seidlmayer, S., 2001. Necropolis. In Redford, D. B. (ed), *The Oxford Encyclopaedia of Ancient Egypt. Volume 2.* Oxford: Oxford University Press: 506-512.

Sethe, K., 1903. *Urkunden des Alten Reichs. I.* Leipzig: Hinrichs.

Shanks, M. and Tilley, C., 1987. *Social Theory and Archaeology.* Cambridge: Polity Press.

Shaw, I., 1986. A Survey at Hatnub. In Kemp, B. J., *Amarna Reports. Volume 3.* London: Egypt Exploration Society: 189-212.

Shaw, I., 1987. The 1986 Survey of Hatnub. In Kemp, B. J., *Amarna Reports. Volume 4.* London: Egypt Exploration Society: 160-167.

Shaw, I., 1991. *Egyptian Warfare and Weapons.* Princes Risborough: Shire Publications.

Shaw, I. M. E., 1992. Ideal Homes in Ancient Egypt: the Archaeology of Social Aspiration. *Cambridge Archaeological Journal.* 2. (2): 147-166.

Shaw, I., 1994. Pharaonic Quarrying and Mining: Settlement and Procurement in Egypt's Marginal Regions. *Antiquity.* 68. 258: 107-119.

Shaw, I., 1998. Exploiting the Desert Frontier: the Logistics and Politics of Ancient Egyptian Mining Expeditions. In Knapp, A. B., Pigott, V. C. and Herbert, E. W. (eds), *Social Approaches to an Industrial Past: the Archaeology and Anthropology of Mining.* London: Routledge: 242-258.

Shaw, I., 2000. Khafra's Quarries in the Sahara. *Egyptian Archaeology.* 16: 28-30.

Shaw, I. and Jameson, R., 1993. Amethyst Mining in the Eastern Desert: a Preliminary Survey at Wadi el-Hudi. *Journal of Egyptian Archaeology.* 83: 81-97.

Shaw, I. and Nicholson, P., 1995. *The British Museum Dictionary of Ancient Egypt.* London: British Museum Press.

Shope, R. E., 1999. How Infections Spread. In De Salle, R. (ed), *Epidemic! The World of Infectious Disease.* New York: The New Press: 85-90.

Sidebottom, S. E., Barnard, H., Harrell, J. A. and Tomber, R. S., 2001. The Roman Quarry and Installations in Wadi Umm Wikala and Wadi Semna. *Journal of Egyptian Archaeology.* 87: 135-170.

Silverman, D. P., 1995. The Nature of Egyptian Kingship. In O'Connor, D. and Silverman, D. P. (eds), *Ancient Egyptian Kingship.* Leiden: E. J. Brill: 49-92.

Simpson, W. K., 1963. *Papyrus Reisner I: the Records of a Building Project in the Reign of Sesostris. Transcription and Commentary.* Boston: Museum of Fine Arts.

Simpson, W. K., 1965. *Papyrus Reisner II: Accounts of the Dockyard Workshop at This in the Reign of Sesostris I. Transcription and Commentary.* Boston: Museum of Fine Arts.

Simpson, W. K., 1969. *Papyrus Reisner III: the Records of a Building Project in the Early 12th Dynasty. Transcription and Commentary.* Boston: Museum of Fine Arts.

Simpson, W. K., Faulkner, R. O. and Wente, E. F., 1973. *The Literature of Ancient Egypt. An Anthology of Stories, Instructions and Poetry.* New Edition. Yale: Yale University Press.

Smith, H. S., 1972. Society and Settlement in Ancient Egypt. In Ucko, P. J., Tringham, R. and Dimbleby, G. W. (eds), *Man, Settlement and Urbanism.* London: Duckworth: 705-719.

Sonbol, A. el A., 1991. *The Creation of a Medical Profession in Egypt, 1800-1922.* Sycracuse: Sycracuse University Press.

Spalinger, A. J., 1985. Notes on the Reliefs of the Battle of Kadesh. In Goedicke, H. (ed), *Perspectives on the Battle of Kadesh.* Baltimore: Halgo: 1-42.

Spalinger, A., 1986. Baking During the Reign of Seti I. *Bulletin de l'Institut Français d'Archéologie Orientale.* 86: 307-52.

Spalinger, A. J., 1998. The Limitations of Formal Egyptian Religion. *Journal of Near Eastern Studies.* 57. 4: 241-260.

Spanel, D. B., 2001. Beni Hassan. In Redford, D. B. (ed), *The Oxford Encyclopaedia of Ancient Egypt. Volume 1.* Oxford: Oxford University Press: 175-177.

Spurr, G. B., 1983. Nutritional Status and Work Capacity. *American Journal of Physical Anthropology.* 4: 1-35.

Stead, M., 1986. *Egyptian Life.* London: British Museum Press.

Steadman, S., 1996. Recent Research in the Archaeology of Architecture: Beyond the Foundations. *Journal of Archaeological Research.* 4: 51-93.

Stevens, A., 2003. Domestic Religion at Amarna. *Journal of Egyptian Archaeology.* 89: 145-168.

Stewart, H. M., 1995. *Egyptian Shabtis.* Princes Risborough: Shire Publications.

Stocks, D., 1986a. Experimental Archaeology 1: Sticks and Stones of Egyptian Technology. *Popular Archaeology.* April 1986: 24-29.

Stocks, D., 1986b. Egyptian Technology II: Stone Vessel Manufacture. *Popular Archaeology.* May 1986: 14-18.

Stocks, D. A., 1989. Ancient Factory Mass-Production Techniques: Indications of Large-Scale Stone Bead Manufacture during the Egyptian New Kingdom Period. *Antiquity.* 63. 240: 525-531.

Stocks, D. A., 1993. Making Stone Vessels in Ancient Mesopotamia and Egypt. *Antiquity.* 67. 256: 596-603.

Stocks, D. A., 1997. Derivation of Ancient Egyptian Faience Core and Glaze Materials. *Antiquity.* 71. 271: 179-182.

Strouhal, E., 1995. Revealing the Sufferings of the Ancient Egyptians. *Egyptian Archaeology: The Bulletin of the Egypt Exploration Society.* 6: 11-13.

Strudwick, N., 1985. *The Administration of Egypt in the Old Kingdom. The Highest Titles and their Holders.* London: Routledge and Kegan Paul.

Stuart, V., 1882. Reports Respecting Reorganization in Egypt. *Parliament Accounts and Papers.* 83: 147-194.

Tapp, E., Curry, A. and Anfield, C., 1975. Sand Pneumocomosis in an Egyptian Mummy. *British Medical Journal.* 3rd May: 276.

Taylor, C. B., 1875. Observations on Miner's Nystagmus, a New Disease. *Lancet.* 1875. 1: 821-2.

Thomas, A. P., 1981. *Gurob: a New Kingdom Town.* Warminster: Aris and Phillips.

Trigger, B. G., 1967. Settlement Archaeology: its Goals and Promise. *American Antiquity.* 32. 2: 149-160.

Trigger, B. G., 1968. The Determinants of Settlement Patterns. In Chang, K. C. (ed), *Settlement Archaeology.* Palo Alto, California: National Press Books: 53-78.

Trigger, B. G., 1972. Determinants of Urban Growth in Preindustrialised Societies. In Ucko, P. J., Tringham, R. and Dimbleby, G. W. (eds), *Man, Settlement and Urbanism.* London: Gerald Duckworth: 575-600.

Trigger, B. G., 1974-1975. The Archaeology of Government. *World Archaeology.* 6: 95-106.

Trigger, B. G., 1997. Ancient Egypt in Cross-cultural Perspective. In Lustig, J. (ed), *Anthropology and Egyptology: a Developing Dialogue.* Sheffield: Sheffield Academic Press: 137-143.

Tucker, T. L. and Hawass, Z., 2000. A Biocultural Study of Health and Centralized Economic Authority during the Roman Period of Ancient Egypt. In *Abstracts of Papers for the Eighth International Congress of Egyptologists.* Cairo: American University in Cairo Press: 186.

Tyldesley, J., 2000. *The Private Lives of the Pharaohs.* London: Macmillan.

Ucko, P. J., 1969-70. Ethnography and Archaeological Interpretation of Funerary Remains. *World Archaeology.* 1: 262-280.

Uphill, E., 1972. The Concept of the Egyptian Palace as a 'Ruling Machine'. In Ucko, P. J., Tringham, R. and Dimbleby, G. W. (eds), *Man, Settlement and Urbanism.* London: Gerald Duckworth: 721-734.

Valbelle, D., 1985. *Les Ouvriers de la Tombe: Deir el-Medineh à l'époque Ramesside.* Bibliotheque d'Etude. 96. Cairo: I. F. A. O.

Valbelle, D., 1990. Craftsmen. In Donadoni, S. (ed), *The Egyptians.* Chicago: University of Chicago Press: 31-60.

Van der Veen, M., 1998. Gardens in the Desert. In Kaper, O. E. (ed), *Life on the Fringe: Living in the Southern Egyptian Deserts During the Roman and Early-Byzantine Periods.* Cairo: Netherlands-Flemish Institute and Leiden: Research School.

Van Driel-Murray, C., 2000. Leatherwork and Skin Products. In Nicholson, P. N. and Shaw, I. (eds), *Ancient Egyptian Materials and Technology.* Cambridge: Cambridge University Press: 299-319.

Van Walsem, R., 2001. Interpretation of Evidence. In Redford, D. B. (ed), *The Oxford Encyclopaedia of Ancient Egypt. Volume 2.* Oxford: Oxford University Press: 175-179.

Vandier, J., 1936. *La Famine dans l'Egypte Ancienne.* Cairo: I. F. A. O.

Vandier, J., 1964. *Manuel d'Archéologie Égyptienne. Volume 4. Bas-Reliefs et Peintures. Scènes de la Vie Quotidienne.* Paris: Éditions A. et J. Picard.

Vandier, J., 1978. *Manuel d'Archéologie Égyptienne. Volume 6. Bas-Reliefs et Peintures. Scènes de la Vie Agricole à l'Ancien et Moyen Empire.* Paris: Éditions A. et J. Picard.

Vercoutter, J., 1959. The Gold of Kush. *Kush.* 7: 120-153.

Vercoutter, J., 1970. *Mirgissa. 1.* Mission Archéologique Francaise au Soudan, 1. Paris: C. N. R. S.

Verner, M., 1986. A Slaughterhouse from the Old Kingdom. *Mitteilungen des Deutschen Archäologischen Instituts Kairo.* 42: 181-189.

Vinson, S., 1994. *Egyptian Boats and Ships.* Princes Risborough: Shire Publications.

Vogel, C., 2003. Fallen Heroes? Winlock's 'Slain Soldiers' Reconsidered. *Journal of Egyptian Archaeology:* 89: 239-245.

Vögele, J., 1998. *Urban Mortality Change in England and Germany: 1870-1913.* Liverpool: Liverpool University Press.

Vogelsang-Eastwood, G., 1993. *Pharaonic Egyptian Clothing.* Leiden: E. J. Brill.

Vogelsang-Eastwood, G., 2000. Textiles. In Nicholson, P. N. and Shaw, I. (eds), *Ancient Egyptian Materials and Technology.* Cambridge: Cambridge University Press: 268-298.

Von Deines, H., Grapow, H. and Westendorf, W., 1955. *Grundriss der Medizin der Alten Ägypter. Volume 2: Von den Medizinischen Texten.* Berlin: Akademie-Verlag.

Von Deines, H., Grapow, H. and Westendorf, W., 1958a. *Grundriss der Medizin der Alten Ägypter. Volume 4: 1: Übersetsung der Medizinischen Texte.* Berlin: Akademie-Verlag.

Von Deines, H., Grapow, H. and Westendorf, W., 1958b. *Grundriss der Medizin der Alten Ägypter. Volume 4: 2: Übersetsung der Medizinischen Texte Erläuterungen.* Berlin: Akademie-Verlag.

Von Deines, H., Grapow, H. and Westendorf, W., 1958c. *Grundriss der Medizin der Alten Ägypter. Volume 5: Die Medizinischen Texte in Hieroglyphischer Umschreibung Autogaphiert.* Berlin: Akademie-Verlag.

Von Deines, H., Grapow, H. and Westendorf, W., 1959. *Grundriss der Medizin der Alten Ägypter. Volume 6: Wörterbuch der Ägyptischen Drogennamen.* Berlin: Akademie-Verlag.

Von Deines, H., Grapow, H. and Westendorf, W., 1961. *Grundriss der Medizin der Alten Ägypter. Volume 7: 1: Wörterbuch der Medizinischen Texte, Erste Hälfte (3-r).* Berlin: Akademie-Verlag.

Von Deines, H., Grapow, H. and Westendorf, W., 1962a. *Grundriss der Medizin der Alten Ägypter. Volume 7: 2: Wörterbuch der Medizinischen Texte, Zweite Hälfte (h-d).* Berlin: Akademie-Verlag.

Von Deines, H., Grapow, H. and Westendorf, W., 1962b. *Grundriss der Medizin der Alten Ägypter. Volume 8: Grammatik der Medizinischen Texte.* Berlin: Akademie-Verlag.

Von Deines, H., Grapow, H. and Westendorf, W., 1973. *Grundriss der Medizin der Alten Ägypter. Volume 9: Ergänzungen (Drogenquanten, Sachgruppen, Nachträge, Bibliographie, Generalregister).* Berlin: Akademie-Verlag.

Von Pilgrim, C., 1997. The Town Site on the Island of Elephantine. *Egyptian Archaeology.* 10: 16-18.

Wagstaff, J. M. (ed), 1987. *Landscape and Culture: Geographical and Archaeological Perspectives.* Oxford: Basil Blackwell.

Waldron, T., 1987. The Relative Survival of the Human Skeleton: Implications for Palaeopathology. In Boddington, A., Garland, A. N. and Janaway, R. C. (eds), *Death, Decay and Reconstruction: Approaches to Archaeology and Forensic Science.* Manchester: Manchester University Press: 55-64.

Waldron., T., 1989. The Effects of Urbanisation on Human Health. In Serjeantson, D. and Waldron, T. (eds), *Diet and Crafts in Towns. The Evidence of Animal Remains from the Roman to the Post-medieval Periods.* British Archaeological Reports British Series. 199. Oxford: 55-73.

Waldron, T., 1994. *Counting the Dead: the Epidemiology of Skeletal Populations.* Chichester: John Wiley.

Waldron , T., 2000. Hidden or Overlooked? Where are the Disadvantaged in the Skeletal Record. In Hubert, J. (ed), *Madness, Disability and Social Exclusion: the Archaeology and Anthropology of 'Difference'.* London: Routledge: 29-45.

Walker, J. H., 1996. *Studies in Ancient Egyptian Anatomical Terminology.* Warminster: Aris and Phillips.

Walton, T., Barondess, J. A. and Lock, S. (eds), 1994. *The Oxford Medical Companion.* Oxford: Oxford University Press.

Wason, P. K., 1994. *The Archaeology of Rank.* Cambridge: Cambridge University Press.

Watts, S., 1997. *Epidemics and History: Disease, Power and Imperialism.* London: Yale University Press.

Weeks, K., 1976-1978. Studies of Papyrus Ebers. *Bulletin de l'Institut d'Égypte.* 68-69: 292-299.

Weeks, K. R., 1979. Art, Word and the Egyptian World View. In Weeks, K. R. (ed), *Egyptology and the Social Sciences.* Cairo: American University in Cairo Press.

Weeks, K. R., 1984. *The Anatomical Knowledge of the Ancient Egyptians and the Representation of the Human Figure in Art.* Microfilm of PhD thesis. Degree Date: 1970. Yale University.

Weeks, K. R., 1995. Medicine, Surgery and Public Health in Ancient Egypt. In Sasson, J. M. (ed), *Civilizations of the Ancient Near East. Volume 3.* New York: Scribners: 1787-1797.

Weinstein, J., 1974. A Fifth Dynasty Reference to Annealing. *Journal of the American Research Center in Egypt.* 11: 23-25.

Weir, J., Wasif, I., Hassan, F., Attia, S. and Kader, M., 1952. An Evaluation of Health and Sanitation in Egyptian Villages. *Journal of the Egyptian Public Health Association.* 27: 55-114.

Weiss, M. M., 1983. Fleas, Flies and Fluid Balance. *Journal of Field Archaeology.* 10: 491-494.

Wendrich, W. Z., 2000. Basketry. In Nicholson, P. N. and Shaw, I. (eds), *Ancient Egyptian Materials and Technology.* Cambridge: Cambridge University Press: 254-267.

Wenke, R. J., 1997. Anthropology, Egyptology and the Concept of Cultural Change. In Lustig, J. (ed), *Anthropology and Egyptology: a Developing Dialogue.* Sheffield: Sheffield Academic Press: 117-136.

Wente, E. F., 1990. *Letters from Ancient Egypt.* Atlanta: Scholars Press.

Westendorf, W., 1999. *Handbuch der Altägyptischen Medizin. 2 Volumes.* Leiden: E. J. Brill.

Westerman, W. L., 1929. *Upon Slavery in Ptolemaic Egypt.* New York: Columbia University Press.

Wild, H., 1953. *Le Tombeau de Ti. Volume 2: la Chapelle.* Cairo L'Institut Français d'Archéologie Orientale.

Wild, H., 1966. *Le Tombeau de Ti. Volume 3.* Cairo: l'Institut Français d'Archéologie Orientale.

Wilkinson, T. A. H., 2001a. Social Stratification. In Redford, D. B. (ed), *The Oxford Encyclopaedia of Ancient Egypt. Volume 3.* Oxford: Oxford University Press: 301-305.

Wilkinson, T. A. H., 2001b. State. In Redford, D. B. (ed), *The Oxford Encyclopaedia of Ancient Egypt. Volume 3.* Oxford: Oxford University Press: 314-319.

Wilson, J. A., 1955. Buto and Hierokonpolis in the Geography of Egypt. *Journal of Near Eastern Studies.* 14: 209-236.

Wilson, J. A., 1960. Civilization without Cities. In Kraeling, C. H. and Adams, R. M. (eds), *City Invincible: a Symposium on Urban and Cultural Development in the Ancient Near East.* Chicago: University of Chicago Press.

Winkler, E. M. and Wilfing, H., 1991. *Tel el-Dab'a: Anthropologische Untersuchungen an den Skelettresten der Kamagnen.* 1966-1969, 1875-1980, 1985. Vienna: Verlag der Österreichischen Akademie der Wissenschaften.

Winlock, H. E., 1945. *The Slain Soldiers of Neb-hepet-Re-Mentuhotep.* New York: Metropolitan Museum of Art.

Winlock, H. E., 1955. *Models of Daily Life in Ancient Egypt from the tomb of Meket-Re at Thebes.* Cambridge, Massachusetts: Harvard University Press.

Wood Jones, F. W., 1908. The Examination of the Bodies of 100 Men Executed in Nubia in Roman Times. *British Medical Journal:* 23-31.

Woods, R. and Woodward, J. (eds), 1984. *Urban Disease and Mortality in the Nineteenth Century.* London: Batsford.

Wreszinski, W., 1909. *Der Grosse Medizinische Papyrus des Berliner Museums.* Leipzig: Hinrichs.

Wright, W. C., 1940. *De Morbis Artificum Bernardini Ramazzini Diatriba: Diseases of Workers: the Latin Text of 1713 Revised with Translation and Notes.* Chicago: University of Chicago Press.

Zandee, S., 1960. *Death as an Enemy According to Ancient Egyptian Conceptions.* Leiden: E. J. Brill.